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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN, THE NATIONAL IRONFOUNDING EMPLOYERS' FEDERATION, THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION.

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Foundry Technical Institute, Meek's Road, Falkirk (*Telephone* 322).

Forthcoming Events.

SEPTEMBER 12-15.
Iron and Steel Institute:—Autumn meeting at Sheffield.

Institute of British Foundrymen.

SEPTEMBER 6.
London Branch:—"Australian Foundry Practice," Paper by R. G. Russell, of Melbourne. Charing Cross Hotel, at 8 p.m.

Technical Books and Technical Reviews.

The constant stream of technical books which comes from the Press suggests that publishing of this kind must in some measure be profitable; otherwise the stream would dry up. The number of technical books published, however, sometimes suggests that publishers of these works make their profits in much the same way as publishers of novels are said to make theirs; that is, by issuing a number in the hope that at least one will strike the public fancy. This is an unfortunate mode of procedure for several reasons. It is usually possible, by expert advice, to obtain a very good opinion as to whether a technical book is likely to succeed or not. An ordinary publisher's reader is, as a rule, quite incapable of coming to a decision on a point of this description.

Another aspect of this matter which has come under our notice recently is that of technical book reviewing. The reviewing of a technical book is essentially a matter for a broadminded expert. The would-be buyer looks, and has a right to look, for reviews in the technical Press for guidance as to whether a book is worth buying. We have seen cases, however, in which the reviewing of technical matter is reduced to a perfunctory basis, in which either a book is not reviewed at all, or it is presented with a restatement of its own preface explaining the object in view. This, of course, is not guidance at all to the average reader, who wants an independent and impartial opinion from someone familiar with the subject who has no axe to grind and no fads to exploit.

Perhaps the worst case arises when a bad technical book is taken by a non-expert editor or reviewed and is lauded in a way which exposes the journal concerned to critical opinions among those who are in a position to know. We have known books practically worthless from the point of view of the student, written by those who may have learned something for themselves in the process of writing but who have no mandate to teach other people, uncritically lauded in a way far beyond the merits of the case. If a book cannot be honestly praised or condemned by an impartial authority it is infinitely better that it should be just listed as received, and the would-be buyer left to judge from the title and standing of the author and publisher.

Bouquets for British Steel Castings.

Probably the most depressing piece of research work which has passed through our hands recently is the recent Report on Steel Castings issued by the National Federation of Iron and Steel Manufacturers and the Iron and Steel Institute. Unless the Report was very carefully studied, one was left with the impression that the foundry industry in Great Britain was scarcely competent to make a complicated steel casting unless it was permitted to have several attempts. Sir Robert Hadfield's contribution to the discussion helped in no small measure to dissipate the gloom. In the February issue of the "Journal of the American Society of Naval Engineers," Capt. Louis Shane reports on his visit to 38 European foundries. He was obviously impressed by the fact that the British Admiralty definitely refuses to accept any casting in which even a minor flaw has been repaired by welding. With few exceptions, European foundries are reported to produce excellent castings, because they are scientifically operated by expert engineers. Capt. Shane praises our system of co-operation between designer, patternmaker and foreman moulder, and states that metal melting and heat-treatment are under the direct supervision of a metallurgist. The tests which British firms obtain with converter metal has brought forth appreciative comment from Capt. Shane. To comment upon the author's references to American conditions would be discourteous after his kindly criticism of European practice, but we can extract from the discussion which followed the presentation of the Paper the lesson that our equipment is not quite "*le dernier cri*." This, the moment that insensate competition ceases, will soon be remedied, as most steel founders have their plant-improvement programme all ready for putting into effect the moment financial conditions allow. The bouquets so graciously handed over by Capt. Shane will be much appreciated by the steel foundry industry, as they will help to relieve the gloom created by the first steel castings Report.

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Coke Shatter Indices.

To the Editor of The Foundry Trade Journal.

Sir,—I have read with interest the article by Dr. W. R. D. Jones in your issue of August 24, 1933, entitled "Coking Practice in the South Wales District."

It contains a number of statements which would not be universally accepted by coking technologists, but at this stage I merely desire to draw attention to the misleading figures of shatter indices for Durham cokes.

The cokes quoted at 72.6 S.I. do not normally appeal to foundrymen. The average for Durham cokes is much higher than this figure. Some of the best Durham foundry cokes have shatter indices as high as those of the best Welsh foundry cokes, *i.e.*, 90 and over on a 2-in. screen.

As the Paper was read to the Institute of British Foundrymen, the figures quoted in it are likely to convey to foundrymen an erroneous idea of the relative values of foundry cokes from different districts.—Yours, etc.,

W. E. Mordecai.

Bearpark Brancepeth Colliery, Durham.
Coke Oven Dept.
August 25, 1933.

The Sir John Cass Technical Institute.

The new session of the Sir John Cass Technical Institute, Jewry Street, Aldgate, E.C.3, which extends over about 36 weeks, will begin on Monday, September 25, and students will be enrolled during the preceding week. The Institute provides instruction in pure and applied mathematics, physics, chemistry, botany, zoology, bio-chemistry of fermentation, petroleum technology, fuel technology (including coal carbonisation and gas manufacture), metallurgy, foundry practice, assaying, geology, modern languages, arts and crafts and tailoring. The science courses are arranged to meet the requirements of those engaged in chemical, metallurgical, electrical, petroleum and fermentation industries, and are held from 6 to 10 p.m. Full facilities are provided in well-equipped laboratories for special investigations and research.

The instruction in experimental science also provides systematic courses for the examinations of London University, the Institute of Chemistry and the Institute of British Foundrymen, in conjunction with the Institute of Mechanical Engineers and the City and Guilds of London Institute.

The Principal (Prof. Patchin) or heads of departments will be pleased to advise intending students at the commencement of the session on the course they should undertake.

British Industries Fair.

PUBLICITY ARRANGEMENTS.

The Department of Overseas Trade announce that they have reappointed Dorland Advertising, Limited, as their advertising agents for next year's British Industries Fair, which opens in London and Birmingham, on February 19, 1934. The agents for the separate advertising of the Birmingham section will be, as for the last Fair, Amalgamated Publicity Services, Limited, London.

Mr. Sydney Walton will again direct the news service of both the London and Birmingham sections of the Fair and the news for these sections will be handled by Mr. Robert Williamson, from 10, Adam Street, Adelphi, W.C.2.

District Presidents.—No. 3.

INSTITUTE OF BRITISH FOUNDRYMEN, MIDDLESBROUGH BRANCH.

Mr. John E. Mercer, the newly-elected chairman of the Middlesbrough Branch of the Institute of British Foundrymen, is superintendent of the foundries owned by Messrs. Head, Wrightson & Company, Limited, of Thornaby-on-Tees. He joined this firm in 1922 to take charge of the Teesdale Electric Steel Foundry, where the melting plant consisted of a 3½-ton Electro Metals furnace, but the following year a 7-ton Héroult unit was installed. In 1927, when his firm acquired the Stockton Steel Foundry Company, Mr. Mercer was also given the supervision of this foundry, where the plant consists of Tropenas converters of 30-cwt., 3-ton and 4½-ton capacity. Both foundries are reasonably busy on Admiralty, railway and export business.

Mr. John E. Mercer.

Before going to Stockton, Mr. Mercer was in charge of the Vickers electric-steel foundry at Sheffield, his native city, where manganese-steel castings were the main production. Since he joined the Institute in 1926, on the formation of the Middlesbrough Branch, Mr. Mercer has been particularly active in its various committees. He takes a serious interest in educational matters and serves on the Advisory Committee of the Constantine Technical College, where, on the inauguration of foundry classes through the zeal of Dr. Ingall, he had twenty apprentices in attendance.

Reactivity of Foundry Coke.—In the "Mitteilungen aus den Forschungsanstalten des Gutehoffnungshütte-Konzerns," a German patent specification is referred to whereby a knowledge of the reaction temperature of a foundry coke enables a predetermined carbon content in cupola iron to be maintained within 0.05 per cent. Drs. G. Heidhausen and P. Liebaldt have evolved an apparatus for determining the reaction temperature of coke and give data of its use and accuracy. Methods have also been examined for artificially reducing this reaction temperature, as by adding a coating of lime to the coke, but the reduction observed was small in every case. The mean reaction temperature was between 882 and 964 deg. C., which, after saturating the coke with milk of lime and drying was reduced to 804 and 917 deg. C. respectively. It is believed that a more suitable means of reducing the reaction temperature will shortly be evolved.

Superheating Cast Iron.

In earlier investigations Othmar v. Keil and his co-workers have found that in iron-carbon alloys which contain further alloying elements such as silicon, nickel, copper, aluminium, etc., acicular graphite is deposited when the iron solidifies according to the stable iron-graphite system, whereas granular, that is, finely-divided graphite is formed when the iron solidifies according to the metastable iron-cementite system. It was further found that there exists a critical carbon content above which the stable system predominates. The critical carbon content is dependent on the amounts of the alloying elements added and the cooling rate.

In a recent investigation this worker and A. Legat studied the effect of superheating upon the form of the graphite, by thermal analysis and microscopical examination. The melts were made of purest electrolytic iron which was carburised by sugar carbon. Melting and alloying was performed at about 1,400 deg. C., superheating at 1,600 deg. C. for 5 minutes. The melts were cooled at varying rates from 5 to 30 deg. per minute.

In iron-carbon-silicon alloys with carbon contents practically up to the eutectic point, granular graphite was found when the melts were superheated after the addition of silicon. When superheating was performed before adding silicon, acicular graphite was formed. This fact indicates that the effect of superheating was not to destroy carbon nuclei present in the melt, nor to favour the formation of iron carbide, since in the melts superheated before adding silicon, the critical carbon content was lower than in the other melts. In the opinion of the authors, superheating had favoured the coagulation and separation from the melt of the finely-divided ferrous silicate, a reaction product of the ferrous oxide formed during melting with the silicon added.

In iron-carbon-nickel alloys up to the eutectic concentration, granular graphite was formed whether the melts were superheated before or after the addition of nickel, provided that the melting conditions were such that no ferrous silicate could be formed. In all the cases where the temperature was measured by means of a thermocouple using a silica tube as sheathing, the melts solidified according to the stable system. The chemical analysis showed that in these melts the silicon pick-up from the silica tube amounted to from 0.04 to 0.4 per cent.

With iron-carbon-silicon-nickel alloys superheating had no effect. Granular graphite was found only in melts the carbon content of which was below the critical one, the latter being dependent on both the silicon and nickel content. The inefficacy of superheating is in contradiction to the authors' opinion that the formation of acicular graphite is principally due to the presence of finely-divided ferrous silicate in the melt. The authors, however, point out that due to the graphitising action of both silicon and nickel, even traces of ferrous silicate may be sufficient to start the solidification of the stable system, and that the degree of dissociation of the iron carbide in the melt is also of importance. On the other hand, the authors' theory was backed by further experiments in which the iron-carbon alloy was deoxidised by means of aluminium at 1,380 deg. C., superheated, and alloyed with silicon at between 1,350 and 1,400 deg. C. All the alloys showed granular graphite though the carbon content was over the critical figure. ("Die Giesserei," 1933, Nos. 21/22.)

Magnetic Permeability and Iron Losses.—In the "Physikalische Zeitschrift der Sowjetunion," W. Arkadiew calculates the magnetic permeability and iron losses of various ferro-magnetic sheets at various frequencies.

The Strength of Grey-Iron.

By A. C. Vivian, A.C.G.I., Assoc.M.Inst.C.E.

Introduction.

In a Paper entitled "Testing Castings," published in The Foundry Trade Journal of March 19, 1931, Mr. F. C. Edwards shows, by a comprehensive series of tests, how constructive testing can be used to effect economies in the use of metal with added strength and greater assurance against the risk of fracture of grey-iron castings.

The writer analysed a number of records of tests on cast iron culled from various sources, and has evolved from them a method of correlating tensile and transverse strengths on a theoretical basis. On applying the method to the test results referred to above, satisfactory agreement between theory and observed results is again found to obtain, and, with due acknowledgments to Mr. Edwards, the analysis is given hereunder, together with the deductions which it is felt can justifiably be drawn. An indication of the further tests which it would be desirable to carry out to check the method and provide comprehensive data covering the strength properties of cast iron is also added.

The theory underlying the method is of the simplest character. When a beam of cast iron is loaded transversely and fracture occurs, the tensile stress developed in the tension face is equal to the tensile strength of the metal as determined by direct test. The longitudinal strain at any cross-section either in the compression part or in the tension part of the beam is proportional to the distance from the neutral axis. Since in cast iron, stress is not in simple proportion to strain, but exhibits a curved graph on direct test, the transverse stress distribution line will also be curved in the same way. It will not be straight, as in conventional theory; and as the load increases the neutral axis will gradually move farther and farther away from the centroid of the section towards the compression face.

A detailed analysis of this essentially logical hypothesis is given in a Paper, "Elasticity and Plasticity," published in the October, 1931, issue of the English journal, "Civil Engineering." The analysis which follows refers to two entirely distinct characteristics of cast iron, namely, elasticity and plasticity, and a word of explanation of what is intended to be implied by these terms is therefore desirable before embarking on the analysis.

Elasticity and Plasticity.

When cast iron is stressed, the resulting deformation is chiefly elastic; that is to say, all but about 10 per cent. of the deformation will disappear upon removal of the load causing the stress. That part of the deformation which remains and which is called the permanent set is due to plasticity. It should also be noted that it takes time to develop a plastic strain, whereas elastic strain can be regarded as being developed instantaneously. Moreover, the internal reactions to an applied load can only occur by reason of the elasticity of the material, not of its plasticity.

In brief, a study of the elastic properties of cast iron provides the working basis from which the strength of cast iron is calculated. A knowledge of the plastic properties is also important. The view regarding the curvature of the elastic stress distribution line may be surprising to those who hold that cast iron is almost devoid of elasticity. That a view so divergent from the conventional view should nevertheless offer reasonable prospects of removing uncertainties attached to cast iron, is explicable by the fact that Hooke's Law (upon which the conventional view rests) and all that it implies regarding elasticity is not a universal truth, but a particular case of a more general law.

The Test Results.

Fig. 1 shows the types of cross-sections for which transverse test results were given. The theoretical stress distribution lines for each of these types is plotted alongside. Table I gives

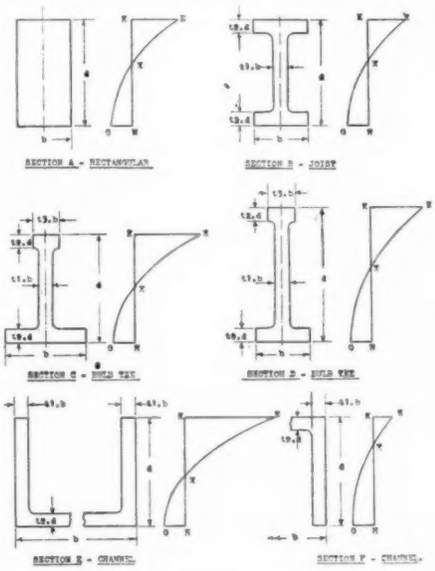


Fig. 1.

the values of tensile strength for various thicknesses of "as-cast" bars. The results in Table I were obtained by plotting the test results given for general grey iron and drawing a smooth curve representing the probable values.

Table I.—*Tensile Strength.*

Thickness "as-cast."	Tensile strength, tons/sq. in.	Sections (See Fig. 1).
½ in.	20.0	E and F.
¼ in.	17.0	B, C and D.
1 in.	14.0	A.

The transverse test-bars, it is stated, were simply supported and centrally loaded at 12-in. centres with single-point loading. The results are reproduced in Table II together with the cross-sectional dimensions of the various bars and the deflections where recorded. Records of weekly averages of "weigh-bridge" metal were also given. These records are stated to refer to transverse tests on 1-in. by 2-in. deep rectangular bars tested on 36-in. centres. Five averages are given, the breaking load (in cwts.) varying from 33.75 to 35.50 and the deflection from 0.321 in. to 0.383 in. The maximum deflection is recorded against the maximum breaking weight, but the minimum deflection corresponds with a breaking load of 34.60 cwts., whilst against the minimum breaking load of 33.75 is shown a deflection of 0.356 in.

Table II.—*Transverse Test Data.*

Bar.	Span in in.	Breaking load, tons.	Deflection, in.	Dimensions of the cross-sections in in.				
				b	d	$t1 \cdot b$	$t3 \cdot b$	$t2 \cdot d$
A	12	4.00	—	1	2	—	—	—
		4.41	—					
B	12	3.5	—	1	2	¼	—	¼
		3.41	—					
C	12	3.71	—	1½	2	¼	¼	¼
		3.86	—					
D	12	3.79	—	1	2¼	¼	¼	¼
		3.80	—					
E	12	0.425	0.096	1⅛	⅛	¼	—	¼
		0.325	0.157					
F	12	0.187	0.08	1⅛	⅛	¼	—	¼
		0.200	0.068					

Design Data.

Upon the assumption that the transverse stress distribution is determined by the shapes of the stress-elastic strain lines of the metal in tension and compression respectively, the moment of resistance of any cross-section can be calculated and the moment of resistance at fracture can be denoted by the equation:—

$$M_{max} = SMJ \cdot b \cdot d^2 \cdot ft,$$

where

SMJ = Section Modulus coefficient which can be calculated for any cross-section and degree of curvature of the stress-strain lines.

b = breadth of section. See Fig. 1.

d = depth of section. See Fig. 1.

ft = breaking strength as determined by direct tensile test.

Values of SMJ for the various cross-sections are stated in Table III. For round bars $M_{max} = SMJ \cdot d^3 \cdot ft$, where d = diameter. The curves marked GXE alongside each cross-section in Fig. 1 are all calculated from the fundamental equation with origin at H Fig. 1.

$$\text{Stress} = p \cdot ft = ft\,(k \cdot J \cdot y^{j-1} - 1)$$

where

p = ratio of any stress (tensile or compressive) to ultimate tensile strength, ft; if p is positive the stress is compressive and if negative the stress is tensile.

k = a constant for a particular shape of cross-section and value of J.

J = a constant for a particular material, and called the Form Factor of the material.

y = ratio of height to total height of cross-section, d, at which the stress $p \cdot ft$ occurs.

The foregoing equation yields stress-elastic strain curves both in tension and compression, which correspond with measured results on grey cast iron when the form factor, J, is given the numerical value 3.20. The basis data given in Table III has been calculated for this value of J. Other grades of cast iron may show values of J, which are in some cases more than 3.20 and in other cases less. The value of J is determinable from tensile and transverse tests, and the basic data can be calculated for the value found.

The constant k alters the scale to which the curves GXE in Fig. 1 are drawn, but not the relative shapes of the lines themselves. Thus in each case the line XH is the axis of tensile strain and the line XG the tensile stress-strain curve, and if the stress lines are all plotted to a common scale they will be found to be identical.

The stress equation previously stated satisfies the fundamental postulate of pure bending that total tension is equal to total compression over the cross-section. Values of k which make the

equation satisfy this postulate, are given in Table III, wherein are also stated the neutral axis height ratio at failure and the maximum compressive stress ratio ($kJ - 1$), which (as may be seen from the stress equation) is the stress ratio on the compression face when the fibres on the tension face reach breaking point.

The design data given in Table III are valid for cross-sections of any size of the relative dimensions stated. For calculation purposes, the fillets (though all-important in the castings) have been neglected to simplify the arithmetic, as they represent only a very small percentage of the total cross-sections.

Table III.—*Theoretical Properties of Sections* (J = 3.2).

Cross-section.	*t*1	*t*2	*t*3	Area ratio.	SMJ	*k*	*q*	*kJ* − 1
A (rectangular)	—	—	—	1.000	0.262	1.000	0.589	2.200
B (joist)	0.250	0.125	—	0.438	0.154	0.855	0.633	1.736
C (bulb tee)	0.167	0.125	0.333	0.292	0.125	1.292	0.525	3.134
C (rev.) (bulb tee)	0.167	0.125	0.333	0.292	0.073	0.639	0.723	1.044
D (bulb tee)	0.250	0.100	0.500	0.350	0.128	1.086	0.568	2.475
D (rev.) (bulb tee)	0.250	0.100	0.500	0.350	0.100	0.753	0.671	1.408
E (channel)	0.111	0.200	—	0.378	0.157	1.666	0.467	4.331
F (channel)	0.111	0.200	—	0.378	0.072	0.610	0.738	0.952
G (round)	—	—	—	0.785	0.166	1.078	0.570	2.450

Note.—Cross-section C (rev.) means C reversed, *i.e.*, with wide flange in compression. Similarly for D (rev.).

Deflection.

It will be appreciated that the deflection of a beam can be calculated upon the stated assumptions. The deflection formula is:—

$$\text{Deflection} = \frac{Sm \cdot L^2}{q \cdot d} \cdot DI$$

where

Sm = elastic tensile strain corresponding with the breaking strength, *ft*.
L = span.
q = neutral axis height ratio at failure.
i.e., q = HX/HK in Fig. 1. (See Table III.)
d = depth of beam.
DI = deflection integral which is calculable for any particular value of the form factor J and type of loading.

For simply supported centrally-loaded beams, the relation between the deflection integral, DI, and the bending moment at the centre is expressed as a graph in Fig. 2, on which is also given calculated values so that the graph can be plotted to a larger scale if desired. This particular graph is calculated for a form factor J = 3.2 and is approximately true for any of the cross-sections scheduled in Table III.

It will be evident that the value of the ultimate tensile strain, Sm, cannot in practice be measured directly. It can, however, be obtained either from a deflection test or from a tensile stress-elastic strain test at, say, 50 per cent. of breaking point. The elastic component must be separated by loading and unloading from the plastic component in such tests.

The foregoing theory of the moment of resistance of a section satisfactorily explains a strongly-marked characteristic of transverse tests on cast iron. This is that even when the greatest possible care is taken to ensure absolute uniformity, the transverse strength of apparently identical bars varies by about 10 per cent. in the case of machined bars and by even more in the case of "as-cast" bars. An examination of the stress lines GXE in Fig. 1 explains the reason. The extreme fibre tensile stress when the bending moment is 90 per cent. of the maximum moment of the section (M_{max}) is about 98 per cent. of the breaking strength. This feature is illustrated in Table IV. It is evident that a cast-iron beam may show considerable variations in strength at fracture and yet be entirely reliable at 50 per cent. of breaking load.

Discussion of Results of Tests.

One of the avowed objects of the tests described in the Paper "Testing Castings" is to enable the designer to gauge the relative strength of various forms. The theory now presented aims at presenting a logical explanation of the conclusions at which the author of "Testing Castings" arrived as the result of constructive testing. The breaking loads calculated on the given data are stated in Table IV. The theoretical strength of the bars C and D is shown to be approximately the same as was found by constructive testing; similarly the conclusions arrived at both by theory and testing are found to be the same in the case of the box sections E and F.

The tensile tests show a strength of about 20 tons per sq. in. for $\frac{1}{8}$ in. thickness of metal and about 14 tons per sq. in. for metal of one square inch cross section. These results suggest that the skin of cast iron is very considerably stronger than the inside. This is supported by

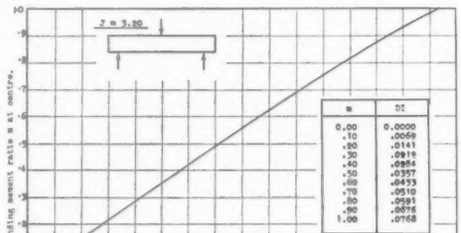


Fig. 2.

the fact that the sections E and F ($\frac{1}{8}$ in. thick) were all skin if one assumes the strength characteristics of the skin to extend for a depth of $\frac{1}{16}$ in., while sections B, C and D ($\frac{1}{4}$ in. thick) were 50 per cent. skin and section A (2 in. by 1 in.) only 20 per cent. skin.

If we assessed the skin strength at 20 tons per sq. in. and the inside at 13 tons per sq. in. we should obtain the following theoretical values of tensile strength of the various thicknesses tested:—

Thickness.	Computation.		Strength.
in.	Per cent.	Per cent.	Tons/sq. in.
$\frac{1}{8}$	100 at 20	0.0 at 13	20.0
$\frac{1}{4}$	50 „ 20	50 „ 13	16.5
1	20 „ 20	80 „ 13	14.4

This suggests that if, for test purposes, bars were cast, say, $2\frac{1}{4}$ in. by $1\frac{1}{4}$ in. cross-section and were machined to 2 in. by 1 in., the tensile strength of the metal of the machined bars would be uniform throughout, except perhaps right at the centre over a negligibly small area. The writer is aware that thick tensile test-bars of grey iron commonly show values of tensile strength greatly below those obtained on slender bars, but, for the reasons set out in detail in a recent Paper ("The Influence of Shape in Tensile Test-Bars," The Foundry Trade Journal, January 28, 1932), it is at least likely that such low values should rightly be attributed to defects in the shapes of the test-bars and not to the metal.

Deflection Tests.

It has been pointed out that the numerical value of the ultimate tensile strain, Sm, is required to enable elastic deflection to be calculated. The test results under review provide only deflection measurements at fracture. Deflection at fracture, like deflection at lower loads, is composed of two parts, a plastic and an elastic component. At lower loads these can be separated, but at breaking loads it is clearly impossible to do so. Moreover, although nearly up to breaking load, the plastic component may amount to no more than about 10 per cent. of the elastic component, at fracture it may be considerably more. Plastic yield depends upon time interval for its full development. Thus deflection measurements at fracture must of necessity show widely varying results. As a first approximation, however, and assuming that the elastic character of the 1 in. by 2 in. "weigh-bridge metal" bars to be similar to that of the box girders E and F, we get a value of Sm of about 0.0036 from the weigh-bridge metal by making an arbitrary allowance for plastic yield at fracture.

From this value of Sm we get a calculated elastic deflection of 0.124 and 0.096 in. for Bar E (measured results 0.096 in. and 0.157 in.) and of 0.076 and 0.081 in. for Bar F (measured results 0.08 in. and 0.068 in.). Because of the incidence of plasticity these results neither prove nor disprove the theory, but deflection calculations have been included, because it has been found that where deflections at intermediate loads are available, the theory provides reasonable agreement with observed results.* This gives a strong measure of support for the hypothesis that the transverse stress distribution lines are of the curved form shown in Fig. 1.

Table IV.—*Analysis of Results.*

Bar.	Breaking load, tons.	Calculated breaking load, tons.	Breaking load, ratio, m.	Tensile strength (Table 1), tons/sq. in.	Extreme fibre tensile stress, tons/sq. in.	Per cent. variation in tensile strength.
A	4.0	4.89	0.82	14.0	13.20	$5\frac{1}{2}$
	4.41	4.89	0.90	14.0	13.73	2
B	3.5	3.50	1.00	17.0	17.00	—
	3.41	3.50	0.97	17.0	16.95	—
C	3.71	4.25	0.87	17.0	16.50	3
	3.86	4.25	0.91	17.0	16.73	$1\frac{1}{2}$
D	3.79	4.54	0.84	17.0	16.24	$4\frac{1}{2}$
	3.80	4.54	0.84	17.0	16.24	$4\frac{1}{2}$
E	0.425	0.46	0.92	20.0	19.74	$1\frac{1}{2}$
	0.325	0.46	0.71	20.0	17.20	14
F	0.187	0.21	0.89	20.0	19.55	$2\frac{1}{4}$
	0.200	0.21	0.95	20.0	19.90	$\frac{1}{2}$

Deductions.

If the theory upon which Table III is calculated be substantially correct, it should be possible to predict the breaking load of beams of the relative shape of any of the sections scheduled. For example, if Bars C, which were tested with the wide flange in tension were tested with the wide flange in compression, the maximum break-

* "Analysis of B.C.I.R.A. Tests by Form-Factor Method." Foundry Trade Journal, March 16, 1933.

ing load on 12-in. centres can be deduced theoretically as:—

$$W_{max} = \frac{4}{12} \times 0.073 \times 1.5 \times 2^2 \times 17 = 2.48 \text{ tons.}$$

(N.B.—SMJ from Table III for this section = 0.073.) Similarly, the breaking load for Bar D reversed (*i.e.*, wide flange in compression) = 3.54 tons.

On actual tests these bars should break at loads between 2.0 and 2.5 tons in the first case and between 2.8 and 3.6 tons in the second case. As regards the value of the form factor J assumed for grey iron, Mr. J. G. Pearce has shown that the ratio of transverse stress (or rupture modulus) to tensile strength is 1.72 for a 1.2-in. dia. round beam. For a form factor of J = 3.2 the rupture modulus would be (from Table III):—0.166 by 32.0/π = 1.69, so that the value J = 3.2 has a sound basis in observed fact.

Machined *v.* "As-Cast" Test Specimens.

There will be general agreement that if the contentions now set out are true, a useful method will become available for supplementing data available from constructive testing for design purposes.

The test results on "as-cast" specimens under review, considered in conjunction with a number of other results on machined specimens suggest that duplicate sets of tests are desirable to determine fully the strength properties of a particular grade of cast iron. Since more consistent results will be obtainable with specimens in which about $\frac{1}{8}$ in. (or more) depth of metal has been machined off than with "as-cast" test-pieces, experiments with machined specimens are particularly desirable.

As is emphasised in the Paper under review, constructive testing does not provide the whole information required for design work, such subjects as shrinkage and camber, as well as metallurgical considerations needing separate treatment. But if the tensile and transverse strengths of test-bars are shown to be capable of simple explanation, a big step forward will have been made.

Primary Objects of Constructive Tests.

Two main probabilities emerge from the researches into the meaning of test results which have been made. One is that the elastic characteristic of cast iron is apparently constant for a number of grey irons produced in different foundries. The other is that the plastic character of metal may be found to vary widely from foundry to foundry, and in the same foundry by slight differences in alloying elements and differences in melting and solidifying conditions. If this is true, the primary object of constructive testing should be to separate the plastic and elastic components in strain or deflection measurements and to assess their relative values.

Outline of Preliminary Tests.

With this object in view, the following suggestions are offered for some constructive testing. They are prompted solely by engineering considerations and need the skilled hand of metallurgist and foundryman to make them comprehensively useful. They are calculated to provide data for use in designing castings up to a maximum thickness of any part of $1\frac{1}{4}$ in. "as-cast."

Specimens suggested.—Six bars 2.2 in. by 1.2 in. by 42 in. long as-cast, six standard 1.2 in. bars (B.S.I. Spec. No. 321—M Bar 1.2 in *d* by 21 in.), and six bars $\frac{1}{8}$ in. thick by 2 in. wide at ends by 1 in. wide at mid-part for a length of 2 in. and 8 in. long overall. Total net weight 2 cwts. Records of chemical composition, melting and casting conditions are important.

Tests Suggested.

(*a*) *Transverse Tests.*—Three bars 2.2 in. by 1.2 in. tested as cast on 36-in. centres; three bars machined to 2 in. by 1 in. tested on 36-in. centres; three bars 1.2-in. dia. tested as cast on 18-in. centres; three bars machined to 1.0-in. dia. (from round bars) tested on 18-in. centres; three bars machined to 1.0-dia. (from 2 in. by 1 in. bars) tested on 18-in. centres; and three bars (from 2 in. by 1-in. bars) machined to channel section of the relative dimensions of Section F (Fig. 1 and Table III) with b=2 in. and d =1 in. tested on 18-in. centres with the plate in compression.

(*b*) *Tensile Tests.*— (i) Twelve bars (six from 1.2-in. dia. bars and six from 2.2-in. by 1.2-in. bars) machined to the dimensions of the B.S.I. standard M bar, except that the gauge length diameter should be made 0.564 in dia. instead of 0.798 in. dia. and the radius altered to suit; (ii) six bars $\frac{1}{8}$ in. thick tested as cast.

Lead-deflection and load elongation measurements should be made on some of the bars as well as fracture tests on all of the bars. From these tests or a selection from them it would be possible to obtain numerical values of the constants of the material, namely:—

J = form factor of material.
ft = breaking strength.
Sm = ultimate tensile elastic strain corresponding with breaking strength, *ft*.

In making deflection and elongation measurements, the load should be released after each observation and the permanent set noted. The difference between the total deformation and permanent set is reckoned the elastic deformation. All the tests should be run through as far as practicable at a uniform rate and measurements made for increasing loads only. The latter is important since cast-iron exhibits marked "elastic hysteresis," or, as it might be called, "backlash" within the material.

Conclusion.

When bars are tested transversely there sometimes occurs a slight loss of deflection at fairly high stresses. This marks, in all probability, the commencement of appreciable plastic yield on the compression side of the beam. For plastic yield on the compression side will tend to increase the height of the neutral axis, *i.e.*, the value of q (see Table III) is increased above its theoretical value and, as indicated by the deflection equation, an increased value of q means a reduced deflection.

The results recorded for Bars E and F illustrate this point. The theoretical compressive stress at failure for Bar E at failure is 20 by 4.331 (Tables I and III) = 86.6 tons per sq. in., which is well above the stress at which considerable plastic yield (if not failure) will occur on the compression face. Thus the first bar of type E (see Table IV), which can only have reached even as high as 92 per cent. of the theoretical strength by reason of very considerable plastic yield on the compression face, shows considerably less deflection than the second bar, which failed at 71 per cent. of the theoretical strength when the compressive stress was about 42 tons per sq. in.

An examination of Table IV will show that Section E is the only one which gave results seriously at variance with the calculations, and since the theory provides a reasonable explanation of the discrepancy, it is confidently offered as a promising means of dispelling the uncertainty which is frequently, but often quite unjustly, attached to cast iron.

Chrome-Molybdenum Castings.—A low-chromium casting steel alloyed with 0.50 per cent. molybdenum has been added to its list of cast alloy products by a U.S. firm to meet the requirements of oil-still parts. High strength and resistance to corrosion, especially to that of hydrogen-sulphide gas at high temperatures, and also a small creep factor are among the special requirements. The chromium content ranges from $4\frac{1}{2}$ to $6\frac{1}{2}$ per cent. and the carbon from 0.15 to 0.35 per cent. According to "The Iron Age," the tensile strength is guaranteed at about 50 tons per sq. in. The corresponding yield points are from 33 to 40 tons. At 1,000 deg. Fah. the yield point is about 27 tons and the tensile strength about 33 tons.

Decomposition of Cementite by Catalytic Action.

Some observations on the decomposition of cementite by the catalytic action of gases have been reported by F. Roll in "Die Giesserei," 1933, Nos. 23/24. Cast iron containing total carbon 3.15, Si 1.98, Mn 0.78, P 0.44 and S 0.104 per cent. was cast at about 1,380 deg. C. in (1) green-sand mould (7 per cent. of water); (2) green-sand mould containing 2 per cent. of coal dust (31 per cent. of volatile matter); (3) green-sand mould containing 6 per cent. of coal dust (31 per cent. of volatile matter); (4) dried and blacked mould, and (5) dried mould coated with alumina. With castings Nos. 1 and 5 no effect of the mould surface upon the structure could be detected. Casting No. 2 showed a thin ferritic zone at the edge, which was somewhat broader with casting No. 3. The greatest effect was found with casting No. 4, the structure of which was ferritic up to a depth of 0.03 in. The graphite flakes in the ferritic zone were broader and longer than in the centre, which consisted of pure pearlite. The cause of the acceleration of the cementite decomposition seems to be the presence of carbon dioxide (or monoxide) as a reaction product of the air with the carbon containing mould material. The innoculating effect of the latter seems to be of minor importance.

Further proof of the catalytic action of CO_2 was furnished by the following experiment. Cylindrical cast-iron test-pieces were annealed at 800 deg. C. for 8 hrs. in air and in a mixture of air and carbon dioxide (30 per cent.). The air-annealed sample showed only a few small ferritic areas at the edge, whereas the other sample had been decarburised up to a depth of 0.016 in. In the ferritic zone the carbon content had dropped from 3.11 to 2.91 per cent., and was further reduced with annealing periods longer than 8 hrs. Further tests showed that ammonia gas is neutral, whereas hydrogen sulphide is a retarding agent in spite of its heavy corroding action.

Abrasive Tools for Fettling.

Mr. E. T. Larson, writing in "Grits and Grinds," has devoted a section of his article on "Using Bricks and Sticks" to applications in the fettling shop. Mr. Larson states:—

For cleaning and smoothing up large castings—machine bases, for example—preparatory to painting, where a portable grinding machine of suitable type is not available and where the production does not warrant the purchase of one, abrasive rubbing bricks manipulated by hand are used effectively. Such bricks are available in different sizes to fit the size and shape of the casting to be cleaned. A common size is 2 in. by 3 in. by 6 in.

On grey-iron castings Crystolon bricks in 20 or 24 grit and grade Q or R are commonly used, while Alundum bricks in the same grain and grade range are best suited for steel and malleable-iron castings. For removing burnt-sand cores from castings Norton Bakelite bonded Alundum sticks, shaped like half-round files and reinforced with a steel-wire centre, are more economical and equally as effective as steel files commonly employed for this purpose. These Bakelite bonded Alundum sticks are generally supplied in grain 30 or 36, grade P.

Magnetic Fields and Hardening in Metals.—In "Metallwirtschaft," H. ESSER and H. CORNELIUS describe experimental work showing that powerful magnetic fields have no effect on the hardness-time function of tempered steels, although there may be some effect on the changes taking place within the crystal lattice.

Mechanical Properties of Steel Cast from the Electric Furnace.

In the May 12 issue of "Die Giesserei," E. Knipp presents data on the strength properties of electric steel cast at room and elevated temperatures and the effect of heat-treatment and of carbon and manganese content. Of a steel containing carbon 0.18 per cent., which was annealed at 920 deg. C. for 4 hrs. and slowly cooled in the furnace, the strength properties at elevated temperatures, as revealed by the short-time

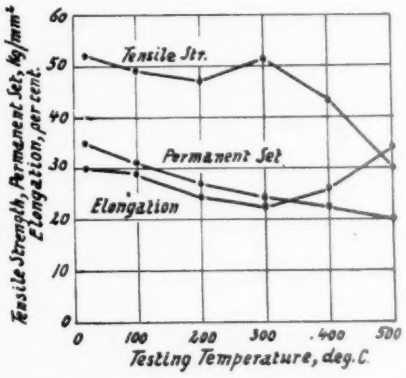


Fig. 1.—Short-Time Tensile Tests at Elevated Temperatures of Electric Steel.

tensile test, are shown in Fig. 1. At 500 deg. C. the permanent set limit was determined by means of the Martens' extensometer as the 0.2 limit—that is, the load which gives a permanent elongation of 0.2 per cent. By long duration tests, the limiting creep stress at 500 deg. C. was found to be about 8.25 tons per sq. in. As limiting creep stress was taken the load which produces a creep rate of 15 by 10^{-4} per cent. per hour during the 25th and 35th experimental hour. The relatively high-creep limit shows that the steel is well suited for high temperature and pressure service.

By suitable heat-treatment, the mechanical properties of carbon steel can be varied within wide limits, and in many cases strength figures can be obtained which compare favourably with those of alloy steel. The effect of varying heat-treatment upon the tensile strength of the 0.18

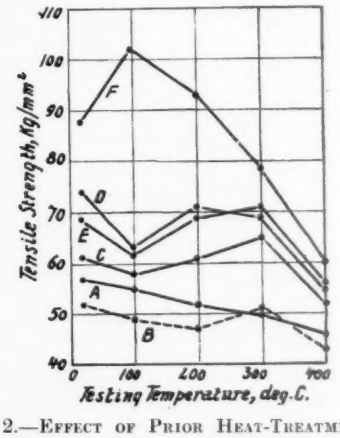


Fig. 2.—Effect of Prior Heat-Treatment on Tests at Elevated Temperatures.

per cent. carbon steel at room and elevated temperatures is shown in diagram Fig. 2. The curves have the tendency to meet one another at a temperature above 500 deg. C.—that is, the hardening effect exerted by the heat-treatment disappears at higher temperatures. The course of the curves is principally dependent on the length of testing time which in the present experiments was half an hour. With a longer testing time the tempering effect will be more pronounced and the curves will meet at lower temperatures. Therefore, for high-temperature service the hardening structure of carbon steel is of no value. In such cases the most desirable structure is the granular pearlite. The curves in Fig. 2 further show that the quenching rate has a great bearing upon the temperature of temper hardness (blue shortness range). With the steel quenched in water (sample F), the rise in tensile strength starts already at 20 deg. C., with the oil-quenched steel (D) at 100 deg. C., and with the slowly-cooled steel (B) at 200 deg. C. Since blue shortness is generally considered to be a precipitation phenomenon, the above fact can be explained by that precipitation starts already at temperatures below 200 deg. C., and makes itself conspicuous by a rise in strength the sooner the finer and denser the structure is—that is, the higher the quenching rate. With a very coarse-grained structure as is exhibited in the untreated steel, the effect of precipitation is not perceptible, and therefore curve A shows no break. The quenching rate has also an influence upon the determination of the permanent set limit, as shown by a halt of the pointer on the dial of the testing machine. The limit could be determined with sample B up to 400 deg. C., with sample C up to 300 deg. C., with sample E up to 200 deg. C., and with sample D up to 100 deg. C. It could not be determined with the untreated steel and the water-quenched steel. The notched-bar impact strength at room temperature was found to be the lowest with the untreated steel and the highest with the steel quenched in oil and tempered at 600 deg. C.

The effect of the length of annealing time upon elongation and notched-bar impact strength was investigated with the 0.18 per cent. carbon steel annealed at 920 deg. C. and slowly cooled in the furnace. It was found that the elongation reached its maximum value after a 4-hrs.' anneal when the steel was tested at 20, 100 and 400 deg. C., whereas annealing for 10 hrs. was necessary with a testing temperature of 200 and 300 deg. C. The notched-bar impact strength at room-temperature reached its maximum value already after annealing for one hour. However, it must be borne in mind that the effect of annealing is greatly dependent upon the size of the casting. The test samples experimented with had a cross section of 1.18 by 1.18 by 7.88 in.

The effect of carbon content upon tensile strength, permanent set and elongation was investigated up to 0.38 per cent., that of manganese up to 1.8 per cent., both at room temperature and 500 deg. C. The curves are practically straight lines, except the manganese-elongation curve at room temperature, which forms a bend over 1 per cent. of manganese.

New Specifications for Aluminium Casting Alloys.

The British Standards Institution announce that the following revised (or new) specifications have now been published, cancelling the previous issues:—

3L.5. Aluminium-Zinc-Copper Alloy Castings (Zn 12.5 to 14.5 per cent.; Cu 2.5 to 3 per cent.).

3L.8. 12 per cent. Copper-Aluminium Alloy Castings.

4L.11. 7/1 Aluminium Alloy Castings (Cu 6 to 8 per cent., Sn 1 per cent. optional).

2L.24. "Y" Aluminium Alloy Castings (Cu 3.5 to 4.5 per cent., Ni 1.8 to 2.3 per cent., Mg 1.2 to 1.7 per cent.).

L.33. Silicon Aluminium Alloy Castings (Si 10 to 13 per cent.).

L.35. "Y" Aluminium Alloy Castings (Heat-Treated).

Coking Technology.—In "Stahl und Eisen," W. Melzer reviews the advances in coking technology made in 1932.

Insulation of Open-Hearth Furnaces.

At a meeting of the American Iron and Steel Institute, held in New York recently, Mr. E. F. Entwistle read a Paper on "Insulation of Open-Hearth Furnaces," in the course of which he pointed out that insulating a furnace resulted in either of two things: (1) The same temperature was maintained with less fuel input per unit of time, or (2) higher temperatures were obtained with the same fuel input per unit of time.

Examination of brick taken from a 12-in. roof of an uninsulated furnace usually showed four distinct zones: The inner zone was $\frac{1}{4}$ in. to $\frac{5}{8}$ in. in depth from which the calcium-aluminium silicates of the bond had been expelled. It was mostly finely-divided tridymite interspersed in the fused mass of the brick, highly glazed, and the most refractory part of the brick. The second zone was usually $\frac{3}{4}$ in. to $1\frac{1}{4}$ in. in depth, was practically all cristobalite, and contained the iron oxide taken into the brick by capillary attraction, and some tridymite. The iron oxide was magnetic and in the form of Fe_3O_4, in which condition it was stable and did not react with the silica even at high temperatures. The fusion point of this zone was about 20 to 40 deg. lower than zone one. The third zone, usually $\frac{1}{2}$ in. to $1\frac{1}{2}$ in. in depth, contained the calcium-aluminium silicates driven back from zone one, and was the weakest and least refractory portion of the brick. Its fusion point was 100 to 115 deg. lower than zone one. The fourth zone constituted the remainder of the brick to its outer surface.

Examination of brick taken from the roof of an insulated furnace showed three zones and possibly part of the fourth. The first zone in structure was the same as the first zone of the uninsulated brick, but three to four times as deep. Behind this zone, the boundary of which was distinct, the second and third zones, and the fourth (if it actually existed) were much less definitely outlined. The iron oxide had penetrated all the way to the cool end of the brick. The third zone was dispersed gradually to the end of the brick, and the definitely weak, rather narrow, area which it formed in the uninsulated brick, did not exist. Sufficient of such brick had not yet been available for complete laboratory determinations as to fusion points, crushing strength, etc., but such examinations as had been made indicated that the average refractoriness of the brick was improved, and that its crushing strength was sufficient to withstand the usual safe working temperatures encountered.

These changes and the high average temperature in the brick that had brought them about constituted the most dangerous condition arising from insulation.

When insulation was applied to the outside surface of a silica wall or roof, the outer temperature rose to an amount dependent on the quantity and quality of the insulating material. In all cases where this was done to an extent considered of worth-while insulating value, the cool end of the brick rose to a temperature well above the critical expansion temperature of the brick, which was from 275 to 575 deg. At this critical temperature its expansion rate was so rapid as to result in the pronounced spalling tendency of silica brick. On uninsulated roofs, particularly those over 15 in., there was a likelihood that some portions of the brick pass through the critical temperature many times during a furnace campaign due to shut-downs for patching, etc., and that the brick life was shortened by these temperature changes. In an insulated wall or roof once up to temperature it was unlikely that any part of the brick approaches the critical temperature except for shut-downs extending beyond six or seven days. During such shut-down the furnace must of course be tightly sealed and shut off from the stack. Laboratory tests showed that silica brick should not be heated through this critical range faster than 160 deg. per hr.

Foundry Selling Practice.

By Eric N. Simons.

In a previous article the possibility of utilising the services of every employee of the foundry in the selling of castings was dealt with from the point of view of wasted opportunities. In the present notes a somewhat different aspect of the matter is discussed. This is the employment of inanimate salesmen, by which paradoxical phrase is meant those forms of selling by other means than human beings and by other agencies than the familiar ones of Press advertising, circularising, catalogues, exhibitions and the like.

The point it is desired to make is that in every foundry there exist numerous opportunities of advertising the castings without paying for it other than nominally, and to advertise castings is halfway towards selling them. As an example, let us take the foundry itself. Every foundry is situated in the neighbourhood of a road, a railway, a sea, a river or a canal. In other words, it is proximate to a line of communication, a highway along which pass daily many types and classes of men. Now the law of averages ensures that among those men who pass, a certain percentage every day, a percentage that will be found to vary but slightly, will be potential purchasers of castings. It does not matter whether that percentage be a fraction of 1 per cent. or 50 per cent. A percentage there will be. If, then, the foundry can make that percentage conscious of its existence, impress itself forcibly upon their minds, it will have taken a valuable step towards disposing of its output. Yet a motor-car journey, a railway journey, a steamer trip down a river, will convince any sceptic that the percentage of works taking advantage of the opportunities presented to them is astonishingly small.

The number of factories displaying, prominently enough to be read by all who pass, their name and address is but few. Still fewer are those that, in addition, display with equal, or approximately equal, prominence, the things they make. Yet almost every foundry has at least one splendid frontage for the display of its speciality and its name. Why does it not make more use of it?

There are various ways in which this can be done. One can use a series of ordinary painted letters, *re-painted from time to time*, taking care that these letters are as large and as legible as possible, so as to increase the distance at which they are readily distinguishable. Individual metal cut-out letters, supported by struts and wires, can be employed. The actual method adopted is a matter to be decided by experts, cost being an important factor. At night—and it is a mistake to imagine that there is no need to display one's sign at night—neon signs can be used, or, as in the case of one large northern foundry, the sign can be flood-lighted, which is cheap and effective.

Once a sign of this sort is in position, it should never be allowed to grow dingy. Nothing looks worse and conveys a worse impression than a neglected sign. There is a firm whose goods I shun to this day because the author passed their works in the train and saw a sign so dilapidated and thick with grime that it conveyed an impression of slovenliness and carelessness.

But the factory frontages, the shop roofs, are not the only possible sites for works signs. In many instances railway bridges cross roads near or beside a foundry. These railway bridges can be turned into excellent permanent advertisements at a relatively moderate cost. Their sides are usually available for the display of advertising matter, and can be hired from the railway companies to whom they belong. A well-placed sign of this kind can give the impression that a whole district belongs to a particular foundry. The main road from Sheffield to Leeds is completely dominated at one point by a railway-bridge sign of this kind, on both sides of the bridge, and the effect is to suggest to a motorist that the works on both sides of the road for a long distance belong to the advertising firm. He cannot but form an impression of size and solidity, while the principal products of the firm legibly displayed enable him to associate this impression with particular products.

Chimneys, too, are specially valuable as display positions, though the upkeep cost will naturally be higher; but consider the commanding position, the prominence, of a sign so placed?

Next are the works motor-cars. It is not suggested that the foundry should plaster its cars with advertisements; but a good plan, adopted by several foundries, is to let the radiator cap be crowned by a mascot representing one of the trade marks of the firm. This is not only an advertisement of a discreet and unobtrusive character, but when the car is sent to a station to meet a customer, the latter has a sign to enable him to pick out the right car, and he remembers the trade mark as a result.

Then there is the stationery issued by the firm. It seems to be a well-accepted idea nowadays that letter paper should carry some sort of dignified indication of the character and products of the firm; but not every foundry extends the notion to such other forms of stationery as invoices, statements, advice notes, boxes, packing cases and the like. Yet all these can be made to carry, without losing either attractiveness or efficiency, an advertising or selling message. For example, a steel founder invoicing castings in the rough can insert a simple line across the head or foot of the invoice: "Are you machining these castings with X brand tool steel?" if he happens to make tool steel as well.

Even the castings themselves can, in certain instances, carry their message with them. When strung together, bagged, or simply sent loose with a label, the labels can be made to advertise other foundry products. There is nothing either undignified, expensive, or eccentric in this. It is a practice coming into increasing use, and it has the advantage that any such message gets right home to the actual user of the goods. It does not have to percolate through half a dozen departments, with a risk of getting lost *en route*.

Then there are the representatives' visiting cards. Too often these confine themselves to the bald statement: "Mr. Smith, representing Messrs. Davy Jones & Co." The buyer, receiving such a card, may gather from some word in the address, such as "Royal Foundry," that he is going to be offered castings, but whether brass, steel, copper, gunmetal or aluminium castings, he is quite unable to judge. The consequence is that the name leaves no permanent impression on his mind. He may be actually in the market for brass castings, but he is busy, and, after all, this man may not be selling brass; so he does not see him. If the card had said clearly somewhere—on the back for perference—"brass castings a speciality," or something of the sort, he would possibly have seen the representative, to the advantage of both.

The back of the card is a blank space that ought to contain a neat alphabetical list summarising the foundry products, and the representative calling on a buyer should make a practice of underlining in pencil the item in this list which he particularly wishes to discuss, and in which he knows or assumes the buyer to be interested.

Another potential means of advertising the foundry products is the delivering vehicle, where road vehicles owned by the foundry itself are concerned. A lorry travelling along the roads, even if only along city roads, can be an effective advertisement, particularly if it is carrying a good load of castings, or a casting of a special type, or an exceptionally large casting. Frequent sight of a lorry indicating to all the world whence it comes and what it carries is bound to leave on the mind of an observer the impression that that particular foundry is active and well-employed. Such advertisement can be painted on the bows of the lorry or along the sides, or sign-cards can be affixed to the load being transported.

Ordinary parcels sent out through the post can likewise be made to carry all over the world an advertising slogan, neatly and without ostentation, or if not a slogan, a small display announcement. This is done by the use instead of string of gummed tape for sealing the parcels. This tape is strong, neat, effective and can be printed on one side with a slogan or device of the type described. It is supplied in reels, and except for parcels of exceptionally irregular shape or clumsy arrangement will be found quite strong enough for all practical purposes. Slogans or advertising matter can be printed in colour, which is an additional advantage.

The daily correspondence can do its share in the work of selling. Simple advertising leaflets, commonly known as "stuffers," can be printed in large quantities at very low cost, and one inserted in every envelope sent out. In this way literature can be carried without extra postage cost right to the men who matter, and it will be found that a percentage of business invariably results from effort of this kind. The cost is merely that of the "stuffer," which one order will readily wipe out.

Thus in innumerable ways the use of inanimate salesmen can bring to the foundry a quantity of business it would get in no other way, and, what is more, will create in the minds of all and sundry a belief that it is a live, go-ahead and enterprising concern. That is all to the good of the foundry and its future.

[We disagree entirely with the author's views on visiting cards. It should be assumed by the seller that his firm's name is a household word in industrial circles, and, on this assumption, the card should only carry the representative's name, address, position and, perhaps, the telephone number. It is a retrograde step to use visiting cards as "silent salesmen," apart from being undignified.—Editor.]

International Organisation of Chemical Documentation.—Scientific and technical literature is increasing at such a rate that it becomes more and more difficult to gather useful material for the benefit of inquirers. There are many bodies that deal with the registration, classification and distribution of such documents. As regards chemical literature, an advance was made in 1932 by the formation of the International Office of Chemistry with headquarters in Paris. A recent conference of international experts of this organisation has set out the duties and functions of the International Office, which will ensure the standardised cataloguing of all chemical literature, to render it immediately available to all persons interested.

Electric Welding Conference.—In connection with the recent exhibition in Germany of electrical heating plant and appliances, a conference on electric-welding practice was held at Duisburg recently under the auspices of the principal technical and engineering associations in the Lower Rhine area. A number of interesting Papers were read, including "Problems of the Electric Arc Welding of Steel," by Dr. Fry, of the Krupp concern; "Electrical Resistance Welding," by Herr Rosenberg; "Development of the Arc Welding Machine," by Herr Bauer; "Automatic Arc Welders," by Herr Ritz; "Electric Welding of Steel Structural Work," by Dr. Bondy; "Welding in Machine Construction," by Herr Jurczyk; and "X-Ray Examination of Iron and Steel, with Special Reference to Welds," by Prof. Dr. Werer, of the Kaiser-Wilhelm Institut für Eisenforschung.

Factories and Workshops in 1932.

EXTRACTS FROM CHIEF-INSPECTOR'S REPORT.

The Annual Report of H.M. Chief Inspector of Factories and Workshops for the year 1932, recently issued, points out that accidents still exact far too heavy a toll, though there are signs that (leaving out of account the last two years, in which trade depression has materially affected the figures), the general level of fatal accidents is lower than formerly. From 1902 to 1914 the numbers varied from about 1,000 to 1,300 per annum and in 1920 the highest number ever recorded (1,404) occurred; from 1921 to 1930 these were consistently fewer, the numbers ranging from about 840 to 980. Any similar comparison for non-fatal accidents is invalidated by the successive changes in the standard of notification, brought about by the Notice of Accidents Act, 1906, and the Workmen's Compensation Act, 1923. Again, the cases of poisoning notifiable by medical practitioners, under Section 73 of the Factory Act of 1901, are now far less numerous, notwithstanding successive extensions to new diseases and the presumably higher standard of reporting. From another aspect the fact that within recent years the number of prosecutions has greatly declined and was for 1932 one-half of the number in 1902, may be taken as a favourable sign.

The total number of accidents reported in 1932 again shows a decrease from 113,249 to 106,164, and the fatalities from 755 to 602. The continued depression in the various industries, particularly in those which are usually responsible for the largest numbers of accidents, is probably the main cause for the reduction; but there is clear indication in the reports received that the growth of the Safety-First movement is also having its effect in reducing accidents in many works where safety organisations have been established and are maintaining a keen active interest in the work of accident prevention.

Buildings under construction again show the greatest number of fatalities for one industry, although the number reported has fallen from 103 to 95, and the non-fatal accidents from 2,844 to 2,216. Smelting, conversion, rolling, founding, etc., come next on the list of fatalities with 72, followed by docks with 68 and chemicals with 30. The docks fatalities show a slight increase, but non-fatal accidents have fallen from 5,251 to 4,940.

Of the total accidents reported, more than half (66,103, including 323 fatalities) were due to the use of hand tools, persons struck by a falling body, persons falling from a height, persons stepping on or striking against objects and persons handling goods or articles. The "human element" is an important factor in the cause of many of these accidents, and much attention is being given at present to such accidents by works Safety Committees with a view to reducing their number.

Safety Organisation.

The following table shows the industries and works mentioned in the draft Safety in Factories Order of 1927 (still in abeyance), and the number of works in each industry in which safety organisations have or have not been established.

Industry.	Works affected.	With safety committees or other forms of safety organisation.	Without safety committees or other forms of safety organisation.
Blast furnaces	52	50	2
Iron and steel mills ..	308	279	29
Heavy engineering ..	299	278	21
Iron founding..	312	266	46
Shipbuilding ..	153	117	36
Total ..	1,124	990	134
1931	1,073	941	132

The number of works affected shows an increase of 51, and there is an increase of 49 works in which safety organisations have been established. This increase is mainly due to the inclusion of a number of foundries where the numbers employed fluctuate round 50 persons and also a number of the smaller iron and steel mills. The works without safety organisations include many which are idle and small works seriously affected by bad trade. The number of Committees on which workers are now represented continues to increase. Much good work is being done generally by the safety organisations in the industries affected.

Explosions.

Blast Furnaces.—A break-out at a blast furnace caused very serious damage to the plant, but fortunately only two workers were injured. The accident happened two hours after tapping, steam being suddenly emitted from one of the tuyere drain boxes; immediately afterwards molten metal came out of the ground near the furnace base and a violent explosion occurred at a point some distance from the base of the furnace. The accident was no doubt due to a break-out of metal through the base of the furnace and the contact of this metal with water. On another furnace in the same works the main tuyere cooling water is carried by an elevated channel to a sump 17 ft. from the furnace wall. Since the accident, similar arrangements have been made for the damaged furnace, the tuyere water being carried overhead to a point 15 ft. from the base, and thence to a culvert where it is joined by the hearth water which flows from a shallow trough round the outer wall of the hearth by way of a surface drain covered with loose plates.

The voluntary rules which were drawn up in mutual agreement between the Chief Inspector and the National Council of Associated Ironmasters with the object of preventing cases of "gassing" have been found to be so much in conformity with the practice obtaining in the best regulated works, that little difficulty has been experienced in securing a good standard of observance generally in all works. Improvements were found to be necessary in some of the older plants, but no objections have been made to carrying out the necessary alterations.

Chromium Plating.—The most troublesome matter in regard to securing compliance with this Code was the provision of efficient exhaust ventilation at the baths installed prior to the advent of the Regulations. Happily this difficulty has been successfully dealt with. No trouble is experienced with new plant as the baths are made to standard design by well-known makers and have very efficient exhaust plant fitted to them. Tests made during the year suggest that the average minimum velocity of the air over the entire area of the bath should not be less than 100 ft. per min. to give the best results, and that the electrolyte should be kept, if possible, at a level at least 9 in. below the exhaust slot opening.

The wide variety of articles plated and the methods of handling them at times cause difficulties, for which, however, experience soon finds a remedy. The dangers of the work are now so well known and appreciated that in the larger works improved methods of working are being devised and adopted in order to lessen the risks involved. The reports show that a high standard of compliance with the Regulations has been secured.

Refractory Materials. — Satisfactory compliance with this Code has now been effected in most of the works concerned. Suppression of dust is generally secured by means of water spray or steam.

Two points of special interest are reported:—(1) The introduction of a process for grinding the surface of the finished bricks. These bricks are coming into favour for building steel furnaces. The grinding machine has an efficient dust-exhaust arrangement fitted to it as supplied by the makers, a German firm. Nevertheless, the process requires careful watching as a possible new source of danger from dust. (2) The addition of a form of lye to the material in the grinding pan which has the result of forming a glazed crust on the surface of the brick after the preliminary drying. This allows of the brick being handled without producing dust. The lye appears to form a bond for the material of the green brick and reduces loss from breakage in handling, so reducing the amount of scrap scattered about also. The firing of the brick appears to burn away the added substance and leaves no trace in the appearance of the brick.

The Steel Castings Association.

Mr. W. B. Lake, J.P., the honorary treasurer of the Institute of British Foundrymen, in a letter to "The Times," comments upon the rationalisation of the iron and steel industry in the following terms:—

"Sir,—My company is a member of one of the associations which it is proposed shall be merged in the Iron and Steel Corporation of Great Britain. This association has striven very hard to improvise and put in practice a scheme for the rationalisation of its particular manufactures, but owing to the uncompromising opposition of an insignificant minority it has been found impossible to proceed with it. The work done by the members has not been entirely fruitless, as two facts have been plainly brought to light:—

"(1) That the work required to organise even one of the smaller associations is so great that the organisation of the main corporation and its 11 groups must be regarded as a really big operation, which will take years of sustained effort to accomplish;

"(2) That it is impossible to obtain sufficient unanimity among the members of an association to enable a scheme of rationalisation to be successful without some statutory powers to enforce it.

"In the light of this experience it is not difficult to understand why practically no progress is being made in the formation of the Iron and Steel Corporation. The work has been entrusted in the main to the National Committee, which consists of the heads of some of the largest undertakings in the industry. These gentlemen have all the qualifications required, but it seems quite unreasonable to suppose that with the heavy responsibilities already resting on their shoulders they can spare the enormous amount of time necessary to organise this vast new undertaking.

"To the outsider it appears that the only way to bring the corporation into being in a reasonable time is to appoint a number of suitable men to devote their whole time to the work, and to arm them with statutory powers to enforce their decisions.—Yours faithfully,

"W. B. Lake,
Governing Director, Lake & Elliot, Limited, Braintree.

"August 18."

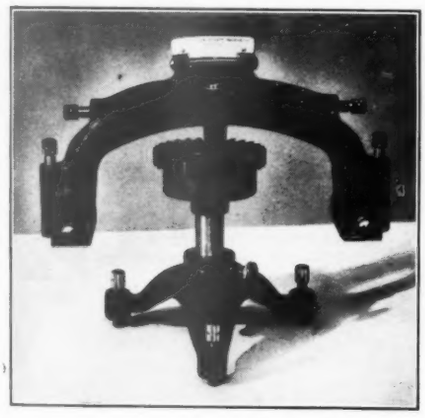
Ceramic Heating Elements for Electric Furnaces.—In "Feuerfest," L. Litinsky discusses the properties and suitability of various ceramic-heating elements for use in electric furnaces, with special reference to Silit and Globar rods.

Herbert Pendulum Hardness Tester.

A SIMPLIFIED MODEL.

The number of special steels, widely different in their properties, which may be in various stages of progress in the modern engineering shop, has made the possession of a simple, accurate and easily portable hardness tester a practical necessity. For straightforward hardness testing in the shop a cheaper, simplified model of the standard Herbert pendulum hardness tester has been designed.

The "S.S." pendulum consists of an arched weight of 4 kg. resting on a steel ball of 1 mm. dia. held in a chuck so that the constants of the instrument and readings obtained are identical with the Herbert pendulum hardness tester. As with the standard model, a 1-mm. spherical diamond can be supplied as an extra with the S.S. model. Similarly, six balancing screws are provided for adjustment and for bringing the centre of gravity of the instrument $\frac{1}{10}$ mm. below the centre of the ball. The "S.S." pendulum is surmounted by a curved spirit level which has a short ivorine scale marked only for taking "time-hardness tests." A circular spirit level is fixed for cross-levelling purposes.



HERBERT PENDULUM HARDNESS TESTER.

The instrument is extremely simple in use: it is placed on the specimen to be tested and set swinging through a small arc. The time of swing is taken with a stop-watch and the number of seconds occupied by ten single swings is the time-hardness number. The following formula is used to convert the latter, T, to Brinell, B, when the steel ball is used:—

$B = 10\ T$ when $T = > 28$

$B = 0.36\ T^2$ when $T = < 28$

It will be observed that on hard materials the conversion is ideally simple.

When a 1-mm. diamond is employed the following formula is used:—$B = 13.5\ D$ when $D > 22.5$; $B = 0.54\ D^2 + 30$ when $D < 22.5$; D = Diamond time-hardness number.

The "S.S." pendulum is supplied with an adjustable levelling table having a sunken glass top which can be used for calibrating the instrument. It is assumed that a stop-watch will be available in most shops, but otherwise one can be supplied with the instrument as an extra. Flat surfaces 6 in. wide or cylinders 8 in. dia. can be spanned by both models of the pendulum. The instrument and levelling table fit compactly into a box 14 in. by $10\frac{1}{4}$ in. by $7\frac{5}{8}$ in. deep, and the weight of the outfit is 22 lbs.

The tester is made by Messrs. Edward G. Herbert, Limited, Atlas Works, Chapel Street, Levenshulme, Manchester.

The Tin Outlook.

By "ONLOOKER."

At the time of writing tin stands at around £220 per ton, and the market seems to be quite unequal to the task of fighting back to £250, which some people believe will be achieved this year. For the moment the steam certainly seems to have gone out of the rise and markets have a jog-trot appearance, which is perhaps characteristic of most commodities at this holiday-time of the year. There has undoubtedly been a certain amount of selling by speculators during the past few weeks, and on this profit-taking ground was lost, but it would be wrong to say that interest in tin has been abandoned altogether, for if sales have been made purchases have been made also. It would, however, be correct to say that the speculative account open in tin is smaller than it was; this is not surprising, for it is notorious that the average speculator in metals comes in *with* the upward movement and not before it.

As a matter of fact the tin position is under suspicion by both consumers and speculators alike, and there is a distinct tendency to mark time pending some classification of the issues at stake. This does not mean that buying by consumers is going to dry up altogether; that is certainly not the case with consumption proceeding at a better rate than for many a long day and the official figures of the deliveries during July at 10,050 tons, which compares with an average during the preceding twelve months of just under 7,000 tons. Consumption at the moment is on a very much better scale than it was in 1932, and although short of what was being used in 1929-30, it compares favourably with the earlier part of 1931, when a good deal of activity prevailed in those trades using tin.

With production curtailed as it is, this improvement in consumption has only been made possible by drawing upon stocks, and at July 31 last total visible supplies were down to 44,400 tons compared with 59,800 tons a year ago. Of this reduction some 13,000 tons has occurred in a lowering of the United Kingdom stocks, which from 33,000 tons at the end of July, 1932, have been brought down to just below 20,000 tons at July 31 last. This is fairly good going, averaging as it does 1,000 tons per month, but whether it will be continued is rather doubtful. However, deliveries in this country are creeping up towards the thousand-a-month mark—July's total was 850 tons—and provided that America still finds it necessary to call on supplies of English refined then the reduction of our stocks, most of which are at Liverpool, ought to go on.

Attention has been drawn to two favourable factors in the tin situation, viz., increasing consumption, which is now at a better level than at any time during the past two years, and the satisfactory reduction in United Kingdom stocks. What then is holding up a further advance in values, for, after all, at £213 tin cannot be called very dear? One of the most obvious causes of disquiet is the fact that excess quantities of tin not accounted for in the published statistics have made their appearance in the shipments during the past few months, and so far no explanation has been offered of this discrepancy. Moreover, the policy of the International Tin Pool in disposing of its stock is uncertain, and the market is left guessing not only as to what the intentions of that body are, but also as to how much of its holding has so far been sold. Yet another matter which has been disturbing all those connected with tin for some time past is the question of increasing production outside the control. Production, which bids fair to develop, has started in the Congo, while China is speeding up to such an extent that for the first six months of this year her shipments were up by 700 tons. This is an in-

(*Concluded in next column.*)

The Wheelabrator.

A NEW FOUNDRY TOOL.

At the American Foundrymen's Convention in Chicago the American Foundry Equipment Company, Mishawaka, Ind., introduced to the trade their Airless Wheelabrator, an entirely mechanical abrasive cleaning machine. The Wheelabrator consists essentially of a motor-driven hollow wheel with small rectangular openings on its periphery. A granulated abrasive is gravity fed from a storage hopper to the wheel and is ejected through the slits on to the work, which passes below. By using several mechanical elements the abrasive escaping from the revolving wheel acquires a high speed from a combination of centrifugal, tangential and aerodynamical forces. Notwithstanding its compactness the Wheelabrator is claimed to equal in production and quality of cleaning more than six abrasive blast nozzles of $\frac{1}{4}$ in. size at 90 lb. air pressure. Further economies are affected, since the abrasive disintegrates less rapidly than when blasted, thereby requiring a less elaborate exhaust system. In addition, compressors, tanks, water separators and coolers are all eliminated. The Wheelabrator, of course, operates at atmospheric pressure, which lessens dust hazard as created by compressed air escaping from the blasting chamber. The makers also claim greatly reduced power cost as compared with compressed air equipment of similar capacity. The Wheelabrator is designed to handle all types of cleaning work. The speed with which work is handled is much greater than with any other type of cleansing agent whether it be acid-pickling, sand-blasting or tumbling.—"Iron Age."

Book Review.

Ausschuss in Der Metallgiesserei (Non-ferrous Foundry Wasters), by Max Schied. Published by the Otto Elsner Verlagsgesellschaft m.b.H. Oranienstrasse, 140-142 Berlin, S.42. Price 4.50 marks.

This little book, which runs to about 90 pages, is well bound, printed on good paper, and clearly illustrated by about 42 simple line drawings. It has as its object the posing of a number of problems associated with defective castings in non-ferrous foundry practice and the offering of a solution thereto. It is divided into four main sections: Waste in the dry-sand foundry; in the green-sand foundry; in the core shop, and in the melting shop. The sections undergo division into about 80 sub-sections, all of which introduce a common problem for solution. The book is written by an experienced foundryman to help the essentially practical man. It is a matter of regret that but few of this type read German, as it is just the sort of book they would thoroughly appreciate.

The Tin Outlook.

(*Concluded from preceding column.*)

creasing menace which is part of the price paid for the luxury of artificial restriction of output.

In spite of all these troubles, however, the price of tin keeps very steady, and there is as yet no evidence of "bear" sales on the London market. What is wanted, however, is a frank statement by the Tin Pool, and also a straightforward exposition of the statistical position by the producers' committee. Consumption of tin has improved, and unless anything untoward happens, this improvement will be carried further, but uneasiness must be allayed and confidence fully restored if matters are to develop along lines satisfactory both to producers and users.

XUM

Methods of Computing Depreciation and Obsolescence.

DUTIES OF WORKS ACCOUNTANTS.

In his Paper on "Depreciation and Obsolescence," read recently by Mr. H. G. Howitt, F.C.A., before the International Congress on Accounting, held in London, he pointed out that when all current repairs were charged to revenue, and where renewals, when they did arise, were renewals of whole units charged to capital, the methods of depreciation in common use were as follow: (1) To spread the charge so that a gradually-decreasing share fell on the later years. The method by which this was accomplished was to calculate depreciation as a fixed percentage on the reducing balance of the asset account. (2) To introduce the consideration of interest, the effect of which was to make a gradually-increasing charge fall on the later years. There were the following two methods which produced this result: (*a*) The sinking-fund method, under which a constant annual sum was provided for depreciation, and in addition a charge was made for interest on the sums so set aside and used in the business, or if such sums were separately invested, the interest earned thereon was itself added to the provisions; (*b*) the annuity method under which interest was charged on and added to the depreciated residue of the asset's cost, and the accumulating total was then written off equally over the period. (*c*) To write off cost *pro rata* over the life or over the use of the asset. This was known as the straight-line method.

Continuing, the speaker said that a percentage charge on the reducing balance was the method most frequently used in England, in cases where the period of life was not so short as to throw an undue burden on to earlier years. Whatever the cause might have been for its adoption, the retention of this method was no doubt encouraged by the fact that the wear-and tear allowances for income-tax purposes were normally computed on that basis. The advantages of this method might be said to be (1) It was conservative in that it placed a heavier charge on the earlier years, thereby recognising in part the heavy loss in value, judged by considerations of resale, that normally took place immediately a new asset was put into use; (2) it graduated the charge, in that however long the assets remained in effective use, there was always some annual charge to be met; there was no sudden relief to revenue through their having become fully depreciated on the books. The main disadvantages were: (*a*) Assets tended to be dealt with in groups with no clear record as to the book value at any date of individual items. The effect, unless plant registers were carefully maintained, might be to leave in capital some portion of an asset's cost long after it has been scrapped, or, alternatively, to rob the reserve which was being accumulated in respect of existing assets. (*b*) There was not sufficient recognition of the slowness of this method in writing an item off, with the result that too low a rate was often adopted.

Depreciation on the sinking-fund basis (continued the speaker) was no doubt in certain respects more scientific, in that it took into account the effects of interest on the fund which was being, or should be, accumulated against the renewal of the asset. It was, however, seldom in practice that the sinking-fund method of depreciation was adopted for commercial purposes in this country—indeed, it must be admitted that it was the exception rather than the rule for a depreciation fund to be separately invested outside the business.

The annuity method was subject to the same criticism as was the sinking-fund method, so far as concerned prudence; and the more so in that the accumulation of interest under it was an internal book entry, not provided from outside investment. The interest provision in this case had indeed nothing to do with the depreciation reserve, but was based on the theory that a charge should be made for the finance necessary to carry a particular asset.

The straight-line method had the advantage of simplicity and certainty of result, and enabled plant registers to be more easily kept for individual items, or classes of items. It did not, however, profess to be particularly scientific in the incidence of its spread over the years, for neither it nor the reducing-balance method dealt with the factor of the earning capacity of the accumulating funds. Whether or not the depreciation funds were separately invested, this factor of earning capacity was at work, and both these methods therefore, in effect, had provided more than the book value of the asset during the period over which they were ostensibly writing it off; they had provided working capital for the use of which no separate interest charge had been made.

Another method of depreciation which might be regarded as coming under this heading was one under which it was sought to write off asset costs *pro rata* on the basis of production—*e.g.*, on the number of tons of steel rolled, etc. The underlying principles in such a case were those of the straight-line method, using the factor of production rather than that of time. The method had its merits in periods of normal trading, but in times of depression it might be found that the annual charge did not adequately cover depreciation. To meet this possibility, such a method would normally provide for a minimum annual charge, and might further be based upon a sliding scale.

Value of Assets.

As regards appraisal of the value of assets, the speaker said that a given asset might be capable of appraisal on many bases, all of interest from different points of view, but not all capable of reflection at the same time in the annual balance-sheet—*e.g.*, (*a*) A scrap value appraisal might in the last resort interest the mortgagee, and an annual review for such a purpose might be desirable; (*b*) periodical appraisal on the basis of replacement cost might be of use for accurately assessing future capital commitments, or for determining the amount to be covered by insurance. It might also be helpful for costing purposes as a guide to selling. True replacement appraisal for such purposes might need to be calculated on the cost of an entirely different and modern unit with appropriate deductions, as it would be meaningless to assume the reconstruction of obsolete plant; (*c*) even on the basis of depreciated original cost appraisal was sometimes desirable in order to re-assess the residue of life of a given asset, and so adjust the depreciation reserve to date; (*d*) a going concern basis of annual appraisal. Appraisals on a going-concern basis could only view the concern as a whole, and even for this purpose they must have primary regard to earning capacity. It was for this reason that for prospectus or similar purposes the valuer usually wished to collaborate with the accountant in order to obtain information in regard to earnings as a guide to the maximum which his valuation should not exceed.

Auditors' Duties.

After referring to the case law of the subject the speaker went on to point out the duties of an auditor, remarking that if the auditor was not satisfied that reasonable depreciation had been provided for the year, whether the amount was disclosed or not, he must qualify his report. He must do so if no depreciation had been provided for the year, unless the accounts specifically stated that the results shown were before making such a charge. Any such full disclosure on the face of the accounts should, it was submitted, relieve the auditor of the need of repetition in his report. In practice, auditors were often told that assets were being maintained so fully out of revenue that they had not, in fact, suffered any depreciation through wear and tear. This argument could not be admitted, for, however efficient the maintenance, all fixed assets, with a few exceptions such as land, must sooner or later be scrapped. In early days commercial depreciation of fixed assets was of small relative importance, for capital was largely of a floating nature. Nowadays, on the contrary, the earning of revenue needed in most cases the sinking of much capital in fixed assets, which assets were largely of value only so far as they could continue to earn revenue. This tendency would no doubt become more in evidence as the industrial system became increasingly intense, and as invention called further for the destruction of obsolete equipment. Hence the special need during the present lull in business activity to stress the importance of depreciation.

Catalogue Received.

Fans.—We have for more than a decade personally reviewed the catalogues emanating from Messrs. Davidson & Company, Limited, Sirocco Engineering Works, Belfast, Northern Ireland, and it is with pleasure that we have noted the constant improvement in presentation, lay-out and utility. The latest to reach us deals with Aeroto patent screw fans, and it marks still further progress. It is artistically jacketed in cobalt blue, ornamented with silver. The lay-out is one which is often favoured by the Americans, that is, the illustrations are placed at the very edge of the corners.

The letterpress has been thoughtfully prepared, and very little criticism can be levelled against it. There is, however, just a little matter. We think that heavy black type should have been used on page 7, where the compiler comments on the Report of the National Physical Laboratory to the effect that for a typical equipment a mechanical efficiency of no less than 89 per cent. is obtained. Surely this is as important as the stressed fact that over 1,000 installations are in general industrial usage, because the former is the determining factor of the latter. We sometimes wonder what is the efficiency of the fans we see slowly turning round in the corners of the less up-to-date foundries and industrial establishments!

A study of the pamphlet cannot fail to impress one with the number and diversity of designs which are available of the screw-type axial-flow fan, and whilst it has met with such a marked success in various directions and can be designed to attain a remarkable high-mechanical efficiency, yet it would be a mistake to assume that it is either intended to supersede, or, indeed, is capable of superseding, other well-known designs of fans for all classes of work. The long experience enjoyed by the Davidson concern, coupled with their technical and development departments, can be relied upon to indicate when and where this relatively new addition to the exclusive range of "Sirocco" products should be used.

Mr. John W. Gardom has established himself in business at 39, Bennett's Hill, Birmingham, 2. His activities include the technical representation of Messrs. Bagshawe & Company, of Dunstable, where for several years he has been works manager. Other activities will be announced later. Mr. Gardom is chairman of the technical committee of the Institute of British Foundrymen, and was last year's Oliver Stubbs medallist.

This Week's News in Brief.

Trade Talk.

MESSRS. WATSONS (METALLURGISTS), LIMITED, have changed their address from Lancaster Street, Sheffield, to Adelaide Works, Mowbray Street, Sheffield, 3.

SIR W. G. ARMSTRONG WHITWORTH (AIRCRAFT), LIMITED, have decided to build an improved version of the Atalanta monoplanes, as a result of the successful survey flight by Imperial Airways with these machines to Australia.

A STEEL SCREW STEAMER of the coasting type has been launched from the shipbuilding yard of Messrs. John Lewis & Sons, Limited, Aberdeen, for Messrs. John Kelly, Limited, Belfast. She is 200 ft. in length and was named "Posapenna" by Mrs. J. S. Lewis.

THE ASKAM IRONWORKS, Lancashire, of the Millom & Askam Hematite Iron Company, Limited, are being dismantled. They were built by the Furness Iron & Steel Company about 70 years ago. These works were busy during the war, but have been idle since. There is one blast furnace at the works.

MESSRS. LITHGOWS, LIMITED, Port Glasgow, have contracted to build a passenger and cargo steamer of 5,600 tons gross for the Jamaica Banana Producers' Association. She will be specially designed to carry 16,000,000 bananas and a limited number of passengers. The propelling machinery will be supplied by Messrs. David Rowan & Company, Limited, Glasgow, and will consist of triple-expansion engines.

MESSRS. WILLIAM DENNY & BROS., LIMITED, Dumbarton, have secured an order from the London & North Eastern Railway Company for two paddle steamers. The order follows on an agreement recently announced between the railway company and the County Council of Fife for the improvement of the ferry services over the Firth of Forth. The vessels will be about 150 ft. long, and will have machinery of special design.

THE BLYTHSWOOD SHIPBUILDING COMPANY, LIMITED, Scotstoun, Glasgow, has secured a contract to build for a London firm an oil tanker, which will be 240 ft. in length, with a gross tonnage of 1,500. Messrs. David Rowan & Company, Limited, Glasgow, will supply the propelling machinery. The Blythswood Company has also secured the contract for reconditioning a large number of vessels and insulating cargo spaces.

THE DOMINION BUREAU OF STATISTICS at Ottawa has just issued a bulletin containing a considerable amount of information relative to the smelting and refining of domestic and imported ores in Canada last year, together with a summary of world statistical data. From this report it appears that 10 Canadian companies operated 13 metallurgical plants last year, having a total capitalisation of 149,708,860 dollars, and employing 5,343 persons, with a total pay roll of 8,778,960 dollars. The value of smelter products turned out was 76,442,076 dollars. Data are also given in the report relative to the operations of the principal smelting and refining plants.

MESSRS. COLVILLES, LIMITED, have secured an order for steel sleepers from the Crown Agents for the Colonies. The sleepers, which comprise a considerable tonnage are intended for Palestine railway construction and extension, will be produced at Glengarnock Works. While the present order is not of such magnitude as to suggest that there will be a very big increase of work for a large number of men over a long period, its size and character are sufficient to warrant a brighter outlook regarding activities at Colvilles, Limited. Other orders for steel have been received of gratifying magnitude during recent weeks, with the result that the Clydebridge works of the firm have been able to work continuously for some weeks.

WORK ON A BRIDGE which, it is claimed, will be the longest in Europe, is expected to start shortly in Portugal. This bridge will, it is stated, stretch 6½ miles across the Tagus, a mile east of Lisbon. It will be more than four times the length of the Forth Bridge. The cost of the bridge is estimated at £3,000,000. It will carry a railway line and a wide roadway providing for fast and slow traffic in either direction. At present the produce of the rich provinces of South Portugal, Alemtejo and Algrave is taken by water across the estuary, or must make a long detour up river to the nearest bridge at Vendas Novas. The Minister of Public Works stated in an interview that it was calculated that the new bridge would carry 700,000 tons of goods every year, and would revolutionise the development of Portugal.

THE GAS COMMITTEE of Glasgow Corporation, at their last meeting, decided not to recommend acceptance of the offer of Messrs. William Baird & Company, Limited, to supply a proportion of the city's gas requirements at 6d. per 1,000 cub. ft. below the present cost of production by the Corporation. The terms of the offer were that the company would supply 6,250,000 cub. ft. of gas per day at 8.4d. per 1,000 cub. ft. The production cost of gas at the present time in Glasgow is 14.24d. per 1,000 cub. ft. The acceptance of the offer would have permitted Messrs. Baird & Company, Limited, to produce pig-iron at a price which would have been competitive with that of foreign iron now largely used in Scottish foundries. The decision of the Gas Committee is open to revision, and the question will in all probability be discussed at to-day's meeting of the Glasgow Corporation.

THE NAMING OF A SHIP launched from the Stannergate yard of the Caledon Shipbuilding & Engineering Company, Limited, Dundee, was postponed until she was moored at the jetty, owing to the vessel sliding away so quickly when the catches were released that the bottle of wine missed the boat. The "Gorgon" has been built to the order of the Blue Funnel Line (Messrs. Alfred Holt & Company, managers), and designed for passenger service between Singapore, Dutch East Indies and Western Australia. The vessel has a gross tonnage of 3,300, a length of 315 ft., moulded breadth of 51 ft., and a designed speed of 14 knots. The propelling machinery consists of a six-cylinder direct reversible airless-injection two-stroke double-acting forced-lubricated crosshead-type engine developing 4,000 i.h.p., which, together with three auxiliary Diesel engines, each driving a 100-kw. dynamo, are being supplied by Messrs. Burmeister & Wain, Copenhagen, and installed at Dundee by the Caledon Company.

Company Reports.

Hurst, Nelson & Company, Limited.—Dividend of 2½ per cent. on the ordinary shares for the year to July 15.

W. Canning & Company, Limited.—Interim dividend at the rate of 6d. per share, less tax, for the six months' trading to June 30

North British Locomotive Company, Limited.—The company is making no interim payment on the preference shares. Payment has been made to December, 1932.

Coghlan Steel & Iron Company, Limited.—Profit for year ended June 30 last, after providing for depreciation, etc., £3,151; brought in, £416; dividend of 5½ per cent. on the preference shares, £2,062; carried forward, £1,506.

Brightside Foundry & Engineering Company, Limited.—After charging maintenance costs and writing off depreciation there is a loss for the year of £1,597. This reduces the credit at profit and loss to £5,490, which is carried forward.

John Lysaght, Limited.—Profit for year to December 31 last, after providing for debenture interest and including dividends from investments and subsidiary companies, £156,878; depreciation account, £80,000; brought in, £412,124; available, £489,003; dividends for 1932 on the preference and second preference shares, £36,000; carried forward, £453,003.

New Companies.

Dineley & Dowding, Limited, 3, Staple Inn, London, W.C.1.—Capital £1,000. General and mechanical engineers.

Britnell Bros., Limited, Handel House, Stokenchurch, High Wycombe.—Capital £1,000 in £1 shares. Engineers, founders, etc. Directors: W. G. Britnell, E. T. Britnell and J. Britnell.

E. P. Chrome, Limited, 20, Woodfield Road, Paddington, London, W.9.—Capital £200 in £1 shares. Chromium plating, polishing, nickelling, etc. Directors: C. W. Edwards and G. A. Stoner.

Personal.

MR. WILLIAM PICKERSGILL, head of the firm of Messrs. W. Pickersgill & Company, shipbuilders, Sunderland, has celebrated his 86th birthday.

MR. J. W. CARTLAND has been appointed managing director of the Birmingham Crucible Company, Limited, Witley Works, Halesowen, Birmingham.

MR. JAMES WALKER, political officer of the Iron and Steel Trades Confederation, is likely to be the only nominee for the position of Labour candidate in Motherwell and Wishaw, rendered vacant by the transfer of the Rev. James Barr to Kilmarnock.

MR. H. C. LOVING, who was successively chief engineer at Sheffield of Messrs. Cammell Laird & Company, Limited, and of the English Steel Corporation, Limited, has been appointed chief engineer of the Tata Iron & Steel Company, Limited, Jamshedpur.

MR. WALTER R. HAWKINS, works manager of the gas-stove department of the Cannon Iron Foundries, Limited, Deepfields, has completed 50 years' service with the firm. To celebrate the event the directors presented Mr. Hawkins with a solid silver tray, in each corner of which is a facsimile of the signature of the four directors—Messrs. R. Talbot Clayton (managing director), R. D. B. Clayton, F. E. S. Clayton and W. Edgar Hawthorne.

AMONGST PEOPLE PROMINENT in the foundry industry who are to participate in the Czecho-Slovakian Convention are Mr. John Cameron, J.P., who, together with Mr. V. C. Faulkner, will officially represent the Institute of British Foundrymen, and Mr. J. G. Pearce, M.Sc., who will represent the British Cast Iron Research Association, the Iron and Steel Institute and the Institute of Metals. Mr. T. Makemson, the secretary of the Institute of British Foundrymen, is also accompanying the party.

MR. GEORGE S. MACLELLAN has been presented with an illuminated address by the employees of Messrs. P. & W. MacLellan, Limited, Glasgow, on the occasion of his retirement from the board of directors of the company, with which he has been connected for 64 years. Mr. MacLellan was vice-chairman of the firm at the time of his retiral. He is one of the few surviving original members of the Pig Iron Trade Association, which was formed in 1881, and was for 22 years chairman of the Laird Line, a post which he relinquished when a few years ago Coast Lines, Limited, assumed control.

Wills.

WEDDELL, ALEXANDER HOUSTON, B.Sc., Park Villa, Uddingston, engineer ...	£6,780
WOOD, JAMES, of Torphichen, West Lothian, director of the Atlas Steel Foundry & Engineering Company, Limited, and of United Collieries, Limited, and other firms	£506,673

Contracts Open.

Harrogate.—Class C vertically-cast iron spigot and socket pipes, in 9-ft. lengths, twice coated with Dr. Angus Smith's solution, for the Corporation. Mr. A. S. West, waterworks engineer, Municipal Offices, Harrogate.

Blackpool, September 11.—Supply and erection of a three-million cub. ft. capacity gasholder, in steel tank, with foundations, for the Corporation. Mr. T. R. Cook, gas engineer and manager, Gas Department, Princess Street, Blackpool, Lancs.

Cape Town, September 13.—32 three-phase transformers, for the City of Cape Town Electricity Department. The Department of Overseas Trade. (Reference A.Y. 11,931.)

Dublin, September 20.—Supply and erection of two electrically-driven axial-flow pumps (10,000 galls. per min. each), for the Corporation. Mr. J. S. Alford, 11, Victoria Street, Westminster, London, S.W.1. (Fee £2 2s., returnable.)

Obituary.

MR. JOHN H. WATERS, President of the National Radiator Corporation (American), died in Washington on August 14, aged 74.

THE DEATH HAS OCCURRED of Mr. William Urquhart, at Appitauld, Kildary, believed to be the oldest working blacksmith in Britain. He celebrated his 90th birthday on May 10 at the forge, and continued at work until his death.

Raw Material Markets.

With the coming of September, the iron and steel markets should begin to throw off the effects of the holiday season, in anticipation of the opening of the autumn trade. The undertone of the markets remains good and prospects of a further expansion of production being registered are regarded hopefully. At the moment the demand for pig-iron is not large, but engagements already entered into promise an extension of deliveries before long. Some of the steelworks are more active on the lighter products than they have been for a long time past. Demand is chiefly from the home markets, progress in the export trades being very difficult to effect under prevailing conditions.

Pig-Iron.

MIDDLESBROUGH.—The market is steady, with no change in the makers' fixed minimum prices, which are 62s. 6d. per ton for No. 3 Cleveland G.M.B. delivered Middlesbrough, 64s. 6d. per ton delivered North-East Coast, 62s. 3d. delivered Falkirk and 65s. 3d. delivered Glasgow. No. 1 foundry iron is 2s. 6d. per ton more than No. 3, and No. 4 foundry and No. 4 forge are at a discount of 1s. per ton. The tonnage of iron going to local establishments shows an improvement following last week's holiday break, when there was a certain addition to stocks. Deliveries to users outside the district are well maintained, with a promise of improvement. The Cleveland makers are unable to make much headway in overseas markets, in spite of the low prices which it is understood have been accepted, but home trade continues to show a steady development, although demand is not yet sufficient to justify the starting of additional furnaces.

The more active conditions in the East Coast hematite trade continue, although here, again, the demand is not enough to warrant increased production. Discussion among the producers with regard to the possibilities of fixing a minimum home price are apparently not yet concluded, but it is thought that an official announcement may be made soon. Meanwhile, the price of East Coast mixed numbers is unchanged at 59s. per ton, with No. 1 quality at 6d. per ton more.

LANCASHIRE.—The light castings trade is the steadiest consumer of pig-iron in this district. Some makers of special machinery are well engaged, but the textile-machinery industry and also the heavy engineering trades are quiet, and their pig-iron needs are restricted. The price position shows no change. For delivery to users in the Manchester zone, Derbyshire and Staffordshire No. 3 irons are quoted at 67s. per ton, with North-East Coast brands at about the same figure, Northamptonshire foundry at 65s. 6d., Scottish foundry at about 80s., and East and West Coast hematite at around 74s. and 80s. 6d., respectively. Plentiful supplies of scrap material continue to be on offer.

MIDLANDS.—There has been very little fresh buying of foundry iron in the Midland counties. This does not indicate any falling off in the demand, but is due to the fact that most consumers have already covered their requirements for some little time ahead. In some cases, bookings have been made to the end of the year. Prices are unchanged at 62s. 6d., delivered, for Northants No. 3 and 66s. per ton for Derbyshire, Lincolnshire and North Staffordshire No. 3. These prices are subject to a small rebate for big tonnages. Continental foundry iron is too high in price to be of interest to Midland consumers, and it is now reported that Cleveland is no longer obtainable at the Derbyshire price, except in one or two special instances. As regards special irons, supplies of Scottish No. 3 are coming through at about 85s., and other medium-phosphorus irons at 70s. to 75s. Special low-phosphorus pig-iron is at from 80s. to 90s., and refined pig-iron for cylinder and similar trades varies according to analysis from £5 to £6 15s. per ton delivered. Trade in hematite pig-iron is dull and new business is only for small tonnages. Welsh and East Coast irons are quoted at 74s. 6d. to 77s. 6d. delivered, and West Coast foundry hematite at 84s. 6d.

SCOTLAND.—The Falkirk founders continue to experience a good demand for light castings, and most of them are working full time. They pay for Middlesbrough iron 62s. 3d. f.o.t. Falkirk and 65s. 3d. f.o.t. Glasgow, but can obtain other English irons at 1s. 3d. less. Demand from other users is quiet, and business is principally of a hand-to-mouth nature. The official prices for Scottish iron remain at 65s. for No. 3 f.o.t. furnaces, with 2s. 6d. extra for No. 1.

Coke.

The coke makers are prepared to book ahead at current prices, but so far as foundry coke is concerned buyers are not showing much interest in the market. Export trade continues to show an improvement, but home demand remains quiet. It is expected, however, that more forward business will be done now that the holiday season is out of the way. For delivery to users in Birmingham and district best Durham coke is quoted at 36s. to 38s., with other qualities about 34s. to 35s., Scottish coke 39s. to 40s. and Welsh coke, according to analysis, from 38s. up to 45s. per ton, delivered.

Steel.

Conditions in the semi-finished steel department are satisfactory to the British works, and most of the manufacturers are busily engaged. Business in finished-steel materials has been rather quieter of late, but this is probably due to seasonal influences. The home market shows signs of becoming more active, and most departments of the British steel industry are moderately well employed. The recent fluctuations in the exchange have made sales of Continental finished steel almost impossible in the British market, and have also affected the export demand.

Scrap.

The scrap iron and steel markets maintain their firm tone. There are plentiful supplies of foundry material about, but suppliers of other classes of material are not always anxious sellers at current levels, as they expect to get better prices later on Even in the case of foundry scrap prices are firmly held. In the Cleveland area good ordinary heavy cast iron is available at 39s. and machinery quality at 41s. per ton, while light cast iron is on offer at 36s. 6d. delivered works. Scrap merchants in the Midlands are experiencing a very steady demand from the local ironfounders for old cast iron, and were it not for the supplies of cheap scrap brought in from other areas prices would probably improve further. For heavy machinery metal in handy sizes 47s. 6d. delivered is being paid, 45s. for heavy pipe and plate scrap and 40s. for clean light metal, delivered works. In South Wales heavy cast iron in large pieces and furnace sizes is priced at 45s., and is in more active request. Light cast is at 41s. to 42s. Good cast-iron machinery scrap for foundry purposes is at 46s. to 47s. 6d. In Scotland, cast-iron scrap has not moved as was anticipated, and it is difficult to find many outlets for machinery metal, in pieces not exceeding 1 cwt., at 50s., while ordinary foundry cast is around 47s. Light cast iron is at 38s. 6d. to 40s., delivered.

Metals.

Copper.—The copper market displays a firmer tone, and the tendency of prices this week has been in an upward direction. The strength of Wall Street and the higher value of commodities in the United States have stimulated the copper market here. Active business has been done, but the price position was not changed much as a result, speculative buying being counteracted by selling and liquidation. It is not easy to judge the future course of prices. If the United States definitely embarks on a policy of inflation, copper prices in America will move upwards, but the effect may not be so very great on the market here, unless there is a decline in the value of sterling. The demand from users of copper in this country is fairly well maintained, but shows no pronounced expansion. With the beginning of the autumn trade some movement should be shortly seen, and it may be that the renewed activity of the market will stimulate interest among buyers.

The week's prices have been as follow :—

Cash.—Thursday, £35 3s. 9d. to £35 5s.; Friday, £35 11s. 3d. to £35 13s. 9d.; Monday, £35 17s. 6d. to £36; Tuesday, £36 2s. 6d. to £36 3s. 9d.; Wednesday, £36 1s. 3d. to £36 2s. 6d.

Three Months.—Thursday, £35 7s. 6d. to £35 8s. 9d.; Friday, £35 16s. 3d. to £35 17s. 6d.; Monday, £36 2s. 6d. to £36 3s. 9d.; Tuesday, £36 7s. 6d. to £36 8s. 9d.; Wednesday, £36 6s. 3d. to £36 7s. 6d.

Tin.—More active trading conditions have been seen in this metal also, and an improvement in sentiment based on happenings in the United States has sent prices on the London market up a few pounds. The outlook for the metal is regarded favourably. Buying by consumers in America and on the Continent is on a good scale, and although consumptive demand here lately has not been large, an improvement is expected now that the holidays are practically out of the way. The statistical position shows further improvement. It is true that there is still a large tonnage in the hands of the Pool, but it is not likely that undue releases will be made.

Daily quotations :—

Cash.—Thursday, £213 7s. 6d. to £213 10s.; Friday, £214 10s. to £214 15s.; Monday, £217 to £217 5s.; Tuesday, £219 17s. 6d. to £220; Wednesday, £219 7s. 6d. to £219 10s.

Three Months.—Thursday, £213 to £213 5s.; Friday, £214 5s. to £214 10s.; Monday, £216 17s. 6d. to £217; Tuesday, £219 15s. to £219 17s. 6d.; Wednesday, £219 7s 6d. to £219 10s.

Spelter.—The rise in the price of this metal seen during the past week is probably due more to an improvement in sentiment in sympathy with other metals than to any direct development in the spelter market. Nevertheless, the undertone of the metal remains good, and the reduction in the Cartel's stocks shows that some improvement has taken place in the consuming trades. A better demand from the galvanisers would no doubt send up the price, but of substantial improvement in this direction there is as yet little sign. Any important fall in values is, however, unlikely.

Price fluctuations :—

Ordinary.—Thursday, £16 16s. 3d.; Friday, £16 17s. 6d.; Monday, £17 1s. 3d.; Tuesday, £17 7s. 6d.; Wednesday, £17 10s.

Lead.—A steady demand continues to be experienced from home users of lead, and the market has a good tone. Consumption is expected to show further expansion with the advent of September.

Daily market prices :—

Soft Foreign (Prompt).—Thursday, £11 17s. 6d.; Friday, £12 2s. 6d.; Monday, £12 3s. 9d.; Tuesday, £12 8s. 9d.; Wednesday, £12 10s.

Acid and Basic Open-Hearth Steels.—In the "Informations de l'Institut des Metaux d'U.S.S.R.," G. L. Sakharoff and M. Strousselba report on comparative investigations of acid and basic open-hearth steels. On comparing an acid steel for gun barrels with steel obtained by Si-reduction in a 10-ton open-hearth furnace and steel from a 15-ton basic furnace, each being finished and treated by the same processes, the acid steel was found to possess the best mechanical properties, especially that obtained by Si-reduction.

Acid-Proof Containers.—An American firm has succeeded in making a new type of pure white, acid-proof vitreous lining blocks and also a new white acid-proof cement; both are marketed under the trade name of Porox. The firm has also a new and novel method of applying the blocks to steel tanks; briefly, the cement holding the blocks is reinforced with steel wire or expanded metal welded to the inner surface of the receptacle. This method was employed recently in an installation of a battery of four glaze tanks, each measuring 7 ft. 6 in. in dia., 5 ft. deep and made from $\frac{3}{8}$-in. steel plate. Expanded-metal linings were spot welded to the interior surfaces, after which these surfaces were given a protective coat of asphalte paint. The underside of the tank tops, manhole openings, and manhole covers were covered with $\frac{1}{8}$ in. of lead. Installation of the acid-proof linings was done on the job after the tanks had been mounted on their concrete foundations; the expanded metal liners were gradually covered with acid-proof cement and the acid-proof blocks set in place. Interiors of the tanks present a pure white surface which not only has all of the acid- and chemical-resisting characteristics of porcelain, but offers maximum resistance to abrasion.

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universally recognised as the leading brand of Cylinder Pig Iron

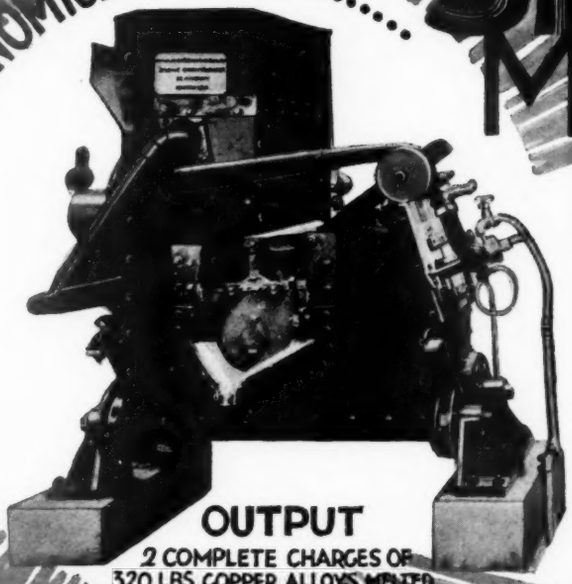
WARNER CBR

The way to BETTER castings

WARNER & CO. LTD. CARGO FLEET MIDDLESBROUGH

FOR FAST & ECONOMICAL MELTING.....

SKLENAR Midget FURNACE



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2 COMPLETE CHARGES OF 320 LBS. COPPER ALLOYS MELTED IN ONE HOUR AFTER PREHEAT

OIL-FIRED

CHARACTERISTIC FEATURES:

No crucibles or pit fires required; Compact with rapidity of service; Perfect control of atmospheric conditions in the furnace with temperatures ranging from 900°C. to 1600°C.; Low fuel consumption; Better metal and reduced metallic losses; Metal under observation throughout; Reduced cost of upkeep; Cost of production reduced 60%; Perfect control of alloys; Oil burning equipment capable of running for long periods without fear of breakdown.

OIL CONSUMPTION: 4½ gallons per hour of fuel oil.
OTHER STANDARD SIZES FOR NON-FERROUS METALS: Coke or Oil fired up to 2 tons. Larger sizes on application.
OIL FIRED FURNACES FOR MELTING GREY IRON AND SEMI-STEEL: Sizes and prices on application.

WILL SAVE UP TO £900 PER ANNUM.
SEND US YOUR ENQUIRIES — OUR TECHNICAL STAFF IS AT YOUR SERVICE.

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BRITISH REVERBERATORY FURNACES LTD.
88. KINGSWAY · LONDON. W.C.2.

RAW MATERIALS—PRICE LIST.

(Wednesday, August 30, 1933.)

COPPER.

	£	s.	d.
Standard cash	36	1	3
Three months	36	6	3
Electrolytic	39	15	0
Tough	38	5	0
Best selected	38	15	0
Sheets	66	0	0
India	48	10	0
Wire bars	40	10	0
Ingot bars	40	10	0
H.C. wire rods	42	10	0
Off. av. cash, July	37	19	0 13/16
Do., 3 mths., July	38	2	3 1/2
Do., Sttlmnt., July	37	19	4 9/16
Do., Electro, July	41	19	6 3/4
Do., B.S., July	40	19	4 1/2
Do., wire bars, July	42	8	6 9/16
Solid drawn tubes			10 1/4d.
Brazed tubes			10 1/4d.
Wire			7d.

BRASS.

Solid drawn tubes	9 1/4d.
Brazed tubes	11 1/4d.
Rods, drawn	8 1/2d.
Rods, extd. or rlld.	5d.
Sheets to 10 w.g.	7 1/2d.
Wire	7 1/2d.
Rolled metal	7 1/2d.
Yellow metal rods	4 1/2d.
Do. 4 × 4 Squares	5 1/2d.
Do. 4 × 3 Sheets	5 1/2d.

TIN.

	£	s.	d.
Standard cash	219	7	6
Three months	219	7	6
English	220	0	0
Bars	221	0	0
Straits	226	0	0
Australian (nom.)	—		
Eastern	224	5	0
Banca	225	7	6
Off. av. cash, July	216	15	7 9/16
Do., 3 mths., July	216	12	4 1/2
Do., Sttlmt., July	216	15	2 9/16

SPELTER.

	£	s.	d.
Ordinary	17	10	0
Remelted	17	0	0
Hard	14	15	0
Electro 99.9	19	10	0
English	18	0	0
India	16	15	0
Zinc dust	20	0	0
Zinc ashes	4	0	0
Off. aver., July	17	15	10
Aver. spot, July	17	15	10 9/16

LEAD.

	£	s.	d.
Soft foreign ppt.	12	10	0
Empire	12	13	9
English	13	15	0
Off. average, July	13	10	2 9/16
Average spot, July	13	8	2 1/2

ALUMINIUM.

Ingots	£100 to £105
Wire	1/1 to 1/9 lb.
Sheet and foil	1/2 to 2/9 lb.

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	25	15	0
Do., V.M. ex-whse.	25	5	0
Rods	30	10	0

ANTIMONY.

	£	s.	d.
English	37 10 0 to 40	0	0
Chinese, ex-whse.	26	15	0
Crude	—		

QUICKSILVER.

	£	s.	d.
Quicksilver	8	15	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—	
25%	6 10 0
45/50%	12 10 0
75%	18 2 6
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free of Mo.	5/6 per lb.
Ferro-titanium—	
23/25% carbon-free	9d. lb.
Ferro-phosphorus, 20/25%	£15 0 0
Ferro-tungsten—	
80/85%	1/9 lb.
Tungsten metal powder—	
98/99%	2/- lb.
Ferro-chrome—	
2/4% car.	25 10 0
4/6% car.	21 17 6
6/8% car.	19 7 6
8/10% car.	18 17 6
Ferro-chrome—	
Max. 2% car.	30 0 0
Max. 1% car.	31 0 0
Max. 0.70% car.	36 2 6
70% carbon-free	10d. lb.
Nickel—99.5/100%	£225 to £230
"F" nickel shot	£202 10 0
Ferro-cobalt, 98/99%	5/6 lb.
Metallic chromium—	
96/98%	2/8 lb.
Ferro-manganese (net)—	
76/80% loose	£10 15 0 to £11 5 0
76/80% packed	£11 15 0 to £12 5 0
76/80% export (nom.)	£9 15 0
Metallic manganese—	
94/96% carbon-free	1/2 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 1/16 in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅜ in.	3d. lb.
Do., under ¼ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

South Wales—	£	s.	d.	£	s.	d.
Heavy steel				2	5	0
Bundled steel and shrngs.	1	17	6 to	2	4	0
Mixed iron and steel	2	0	0 to	2	1	6
Heavy cast iron				2	5	0
Good machinery	2	6	0 to	2	7	6
Cleveland—						
Heavy steel				2	3	6
Steel turnings				1	11	6
Cast-iron borings				1	2	0
Heavy forge				2	10	0
W.I. piling scrap				2	0	0
Cast-iron scrap	1	19	0 to	2	1	0
Midlands—						
Light cast-iron scrap				2	0	0
Heavy wrought iron				2	6	0
Steel turnings, f.o.r.				1	6	0
Scotland—						
Heavy steel				2	2	6
Ordinary cast iron				2	7	0
Engineers' turnings				1	12	6
Cast-iron borings				1	13	0
Wrought-iron piling	2	2	6 to	2	3	6
Heavy machinery				2	10	0

London—Merchants' buying prices, delivered yard.

	£	s.	d.
Copper (clean)	30	0	0
Brass	19	0	0
Lead (less usual draft)	10	15	0
Tea lead	8	5	0
Zinc	10	10	0
New aluminium cuttings	72	0	0
Braziery copper	27	0	0
Gunmetal	26	0	0
Hollow pewter	135	0	0
Shaped black pewter	100	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	65/-
Foundry No. 3	62/6
,, at Falkirk	62/3
,, at Glasgow	65/3
Foundry No. 4	61/6
Forge No. 4	61/6
Hematite No. 1, f.o.t.	59/6
Hematite M/Nos., f.o.t.	59/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	68/6
,, d/d Birm.	84/6
Malleable iron d/d Birm.	115/-
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	62/-
,, No. 3 fdry.	66/-
Northants forge	58/6
,, fdry. No. 3	62/6
,, fdry. No. 1	65/6
Derbyshire forge	62/-
,, fdry. No. 3	66/-
,, fdry. No. 1	69/-
Scotland—	
Foundry No. 1	67/6
,, No. 3	65/-
Hem. M/Nos. d/d	66/-
Sheffield (d/d district)—	
Derby forge	59/6
,, fdry. No. 3	63/6
Lincs forge	59/6
,, fdry. No. 3	63/6
E.C. hematite	73/6
W.C. hematite	83/6
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	67/-
Staffs fdry. No. 3	67/-
Northants fdry. No. 3	65/6
Cleveland fdry. No. 3	67/-
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	80/-
Clyde, No. 3	80/-
Monkland, No. 3	80/-
Summerlee, No. 3	80/-
Eglinton, No. 3	80/-
Gartsherrie, No. 3	80/-
Shotts, No. 3	80/-

FINISHED IRON AND STEEL.

Usual district deliveries for iron; delivered consumer's station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)	9	0	0 to	9	15	0
Nut and bolt iron	6	15	0 to	7	10	0
Hoops	10	10	0 to	12	0	0
Marked bars (Staffs) f.o.t.		12	0		0	0
Gas strip	10	10	0 to	12	0	0
Bolts and nuts, ¾ in. × 4 in.		13	0		0	0
Steel—						
Plates, ship, etc.	8	15	0 to	8	17	6
Boiler plts.				8	5	0
Chequer plts.				10	7	6
Angles				8	7	6
Tees				9	7	6
Joists				8	15	0
Rounds and squares, 3 in. to 5½ in.				9	7	6
Rounds under 3 in. to ⅜ in. (Untested)		6	17	6 & up.		
Flats—8 in. wide and over		8	12	6		
,, under 8 in. and over 5 in.		8	17	6		
Rails, heavy	8	5	0 to	8	10	0
Fishplates				12	0	0
Hoops (Staffs)		9	10	0 & up.		
Black sheets, 24g. (4-t. lots)		10	0	0		
Galv. cor. shts. (,,)		12	10	0		
Galv. flat shts. (,,)		13	0	0		
Galv. fencing wire, 8g. plain		14	0	0		
Billets, soft	5	0	0 to	5	12	6
Billets, hard	6	12	6 to	7	2	6
Sheet bars	4	15	0 to	5	5	0
Tin bars				4	15	0

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	11d.
Sheet to 10 w.g.	12d.
Wire	12½d.
Rods	11d.
Tubes	15½d.
Castings	13d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	17.34
No. 2 foundry, Valley	16.50
No. 2 foundry, Birm.	13.00
Basic	17.89
Bessemer	18.89
Malleable	18.39
Grey forge	18.39
Ferro-mang. 80%, seaboard	82.00
O.-h. rails, h'y, at mill	40.00
Billets	26.00
Sheet bars	26.00
Wire rods	35.00
	Cents.
Iron bars, Phila.	1.86
Steel bars	1.60
Tank plates	1.60
Beams, etc.	1.60
Skelp, grooved steel	1.60
Steel hoops	1.75
Sheets, black, No. 24	2.25
Sheets, galv., No. 24	2.85
Wire nails	2.10
Plain wire	2.10
Barbed wire, galv.	2.60
Tinplates, 100-lb. box	$4.25

COKE (at ovens).

Welsh foundry	20/- to 22/6
,, furnace	15/- to 15/6
Durham and Northumberland—	
,, foundry	21/- to 25/-
,, furnace	13/6
Midlands, foundry	—
,, furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box	16/9	to 17/3
,,	28×20 ,,	33/6	to 34/6
,,	20×10 ,,	23/10	to 24/4
,,	18¾×14 ,,	17/4½	to 17/9
C.W.	20×14 ,,	15/6	to 16/-
,,	28×20 ,,		32/3
,,	20×10 ,,		22/9
,,	18¾×14 ,,		16/6

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0 to	£7	0	0
Bars-hammered, basis	£16	0	0 to	£16	10	0
Bars and nail-rods, rolled, basis	£15	15	0 to	£16	0	0
Blooms	£10	0	0 to	£12	0	0
Keg steel	£30	0	0 to	£31	0	0
Faggot steel	£18	0	0 to	£23	0	0
Bars and rods dead soft, st'l	£10	0	0 to	£12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£ s. d.	
Aug.	24 ..	35 3 9	dec. 7/6
,,	25 ..	35 11 3	inc. 7/6
,,	28 ..	35 17 6	,, 6/3
,,	29 ..	36 2 6	,, 5/-
,,	30 ..	36 1 3	dec. 1/3

Electrolytic Copper.

		£ s. d.	
Aug.	24 ..	39 0 0	dec. 10/-
,,	25 ..	39 5 0	inc. 5/-
,,	28 ..	39 15 0	,, 10/-
,,	29 ..	39 15 0	No change
,,	30 ..	39 15 0	,, ,,

Standard Tin (cash).

		£ s. d.	
Aug.	24 ..	213 7 6	inc. 5/-
,,	25 ..	214 10 0	,, 22/6
,,	28 ..	217 0 0	,, 50/-
,,	29 ..	219 17 6	,, 57/6
,,	30 ..	219 7 6	dec. 10/-

Tin (English ingots).

		£ s. d.	
Aug.	24 ..	214 0 0	inc. 5/-
,,	25 ..	215 0 0	,, 20/-
,,	28 ..	217 10 0	,, 50/-
,,	29 ..	220 10 0	,, 60/-
,,	30 ..	220 0 0	dec. 10/-

Spelter (ordinary).

		£ s. d.	
Aug.	24 ..	16 16 3	No change
,,	25 ..	16 17 6	inc. 1/3
,,	28 ..	17 1 3	,, 3/9
,,	29 ..	17 7 6	,, 6/3
,,	30 ..	17 10 0	,, 2/6

Spelter (Electro, 99.9 per cent.).

		£ s. d.	
Aug.	24 ..	19 0 0	No change
,,	25 ..	19 0 0	,, ,,
,,	28 ..	19 5 0	inc. 5/-
,,	29 ..	19 10 0	,, 5/-
,,	30 ..	19 10 0	No change

Zinc Sheets (English).

		£ s. d.	
Aug.	24 ..	25 15 0	No change
,,	25 ..	25 15 0	,, ,,
,,	28 ..	25 15 0	,, ,,
,,	29 ..	25 15 0	,, ,,
,,	30 ..	25 15 0	,, ,,

Lead (English).

		£ s. d.	
Aug.	24 ..	13 5 0	No change
,,	25 ..	13 10 0	inc. 5/-
,,	28 ..	13 10 0	No change
,,	29 ..	13 15 0	inc. 5/-
,,	30 ..	13 15 0	No change

AVERAGE PRICES OF GALVANISED CORRUGATED SHEETS (NORTH OF ENGLAND).

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1903	11 5 0	11 5 0	11 5 0	11 10 0	11 10 0	11 10 0	11 10 0	11 10 0	11 5 0	11 5 0	11 5 0	11 5 0	11 7 1
1904	11 5 0	11 5 0	11 5 0	11 5 0	10 15 0	10 15 0	10 15 0	10 15 0	10 5 0	10 5 0	10 5 0	10 5 0	10 15 0
1905	10 7 6	10 7 6	10 7 6	10 7 6	10 7 6	10 7 6	10 7 6	10 7 6	11 0 0	11 5 0	11 15 0	12 0 0	10 15 0
1906	12 12 6	12 12 6	12 12 6	12 7 6	12 7 6	12 7 6	12 12 6	12 12 6	12 15 0	12 15 0	12 15 0	13 5 0	12 12 1¾
1907	13 5 0	13 5 0	13 15 0	13 15 0	13 15 0	13 15 0	13 17 6	13 17 6	13 17 6	13 2 6	13 2 6	13 2 6	13 10 10
1908	13 2 6	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 11 0¼
1909	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	10 10 0	11 0 0	11 0 0	11 0 0	11 0 0	11 16 8
1910	11 15 0	12 5 0	12 5 0	11 15 0	11 10 0	11 10 0	11 12 6	11 12 6	11 12 6	11 12 6	11 10 0	11 10 0	11 18 4
1911	11 5 0	11 1 3	10 15 0	10 15 0	10 13 9	10 10 0	10 13 9	11 0 0	11 5 0	11 5 0	11 5 0	11 7 0	10 19 7¾
1912	11 10 0	11 10 0	11 10 0	11 15 0	12 5 0	12 5 0	12 6 0	12 5 0	12 5 0	12 12 6	12 18 0	12 15 0	12 2 11½
1913	12 15 0	12 15 0	12 15 0	12 11 3	11 18 0	11 15 0	11 15 0	11 15 0	11 15 0	11 3 0	11 0 0	11 2 6	11 18 4
1914	11 7 0	11 7 6	11 7 6	11 5 7½	11 2 6	10 15 0	10 15 0	12 17 6	14 2 0	13 7 0	11 15 7	11 2 6	11 16 0
1915	11 10 8½	13 12 6	14 8 9	15 0 6	17 17 6	20 17 6	20 17 6	20 6 3	17 12 6	18 1 0	22 13 9	25 2 0	18 3 4½
1916	26 5 0	27 12 6	28 0 0	28 5 0	29 0 0	29 0 0	28 15 0	28 3 0	28 15 0	28 15 0	28 15 0	28 15 0	28 6 8½
1917	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 15 0	28 0 0	28 0 0	28 0 0	28 11 3
1918	28 5 0	28 15 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	29 0 0	28 13 4
1919	29 0 0	29 0 0	29 0 0	28 0 0	28 10 0	27 7 6	27 5 0	29 3 0	32 0 0	33 0 0	36 10 0	40 8 4	31 5 3½
1920	46 10 0	49 15 0	53 15 0	56 0 0	55 10 0	54 10 0	52 10 0	48 10 0	44 3 4	39 2 6	35 17 6	30 8 0	47 4 3
1921	28 10 0	25 17 6	24 5 0	23 3 4	22 0 0	22 0 0	23 10 0	21 12 6	20 0 0	18 15 0	18 3 9	17 2 0	22 1 7
1922	16 17 6	15 13 9	16 3 0	16 10 0	16 4 4½	15 15 6	15 16 3	16 16 0	16 8 9	16 6 3	17 1 0	17 7 6	16 7 5½
1923	18 3 1½	19 1 11½	19 8 0	19 10 0	19 7 0	19 1 3	18 0 0	18 13 1½	19 0 0	19 3 9	19 2 6	18 19 4½	18 19 2
1924	18 13 6	18 9 4½	18 5 0	17 15 11½	17 3 0	17 19 4½	18 7 6	18 8 1½	18 8 1½	17 19 6	17 11 3	17 10 0	18 0 10½
1925	17 8 6	17 1 6½	16 9 4½	16 12 0	16 9 8½	16 9 4½	16 0 6	16 1 10½	16 5 0	16 7 0	16 12 6	16 15 0	16 11 0½
1926	16 14 4½	16 5 7½	16 0 6	15 11 10½	15 11 3	16 0 0	16 16 0	16 18 9	16 14 0	16 18 9	17 10 0	16 19 0	16 10 0½
1927	16 3 1	15 7 6	15 3 3	15 3 1½	14 14 4½	14 11 6	14 1 10½	14 0 0	13 19 6	13 16 10½	13 13 1½	13 3 9	14 9 10
1928	13 0 0½	13 2 6	13 6 0	13 2 6	13 3 0	13 6 9	13 11 3	13 10 0	13 10 7½	13 12 6	13 11 6	13 10 0	13 8 8½
1929	13 11 0	13 13 1½	13 12 9½	13 10 11½	13 9 3	13 8 9	13 11 6	13 7 6	13 7 6	13 5 6	12 18 9	12 12 9½	13 7 5½
1930	12 5 0	11 15 0	11 19 6	11 18 7	11 18 0	11 17 6	11 17 6	11 17 6	11 16 3	11 12 6	11 8 9	11 5 0	11 15 11½
1931	11 4 0	11 0 0	11 0 0	11 0 0	10 13 9	9 18 9	9 13 0	9 5 3½	8 19 0½	9 16 0	9 8 9	9 4 0½	10 1 10½
1932	9 2 9	9 14 4½	9 16 0	9 13 9	9 12 6	9 12 6	9 11 0	9 4 4½	9 11 3	10 12 6	11 5 0	11 7 0	9 18 7
1933	11 15 0	11 15 0	11 15 0	11 15 0	11 17 6	12 4 0	12 10 0	12 10 0	—	—	—	—	—

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POSITION required as Foundry Foreman. Age 28. Practical moulder with experience on light, medium and heavy castings, switch gear, marine work, including iron, steel and non-ferrous. Good education and technical training. (224)

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250/400 LB. Coke or Oil-fired Tilting Furnace wanted at once. Must be in absolute sound condition and cheap for cash.

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Pneumatic SAND-MOULDING MACHINE, capacity admits boxes 16" x 16" x 6".

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"Winn" SCREWING MACHINE, capacity 1" to 4" pipes.

Two BABCOCK W.T. BOILERS, 150 lbs. w.p.

Four LANCS. BOILERS, 30' x 8', 200 lbs. w.p.

Write for "Albion" Catalogue.

'Grams: "Forward." 'Phone: 23001 (10 lines).

ALBION WORKS, SHEFFIELD.

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FOUNDRY Transverse Bar-Testing Machine by Avery, for 2-in. x 1-in. Bars, 1 to 3 ft. long, calibrated up to 40 cwts., with deflection scale; in good working order. Price £30 or nearest offer.—HARTLEY, SONS & COMPANY, Engineers, Etruria.

TESTING MACHINE. Transverse and tensile, by Denison. Capacity: 2 tons transverse, 2 in. x 1 in. bars over 3-ft. supports, 1 in. by 1 in. bars over 1-ft. supports. Travelling poise weight, deflection scale; price £30. Also No. 2 "Oliver" combined Hand-Surfacing and Power-Feed Thicknessing Machine, type "HA," to take timber up to 20 in. x 9 in. Both in new condition. Price £150, or nearest offer.—MILBURN, Engineer, Workington.

FOR SALE IN GOOD CONDITION:—
Two Power Jar Ram Rollover Pattern Draw Moulding Machines, each 3 tons capacity.
Two Ditto, each 30 cwts. capacity.
Three Tabor Jar Ram Rollover Pattern Draw Moulding Machines, each 6 cwts. capacity.
One Tabor Split Pattern Moulding Machine.
One Tabor 10-in. Squeezer, 3-in. dia. Jar, Roll-over Pattern Draw Moulding Machine, for boxes up to 13 in. x 20 in., 10 in. Straight Draw.
One Macdonald Jar Ram Rollover Machine.
One Tabor Small Jarring Machine.
One Mumford Jarring Machine, capacity approx. 1,500 lbs.
One Hand Ram Trunnion Rollover Machine to take boxes up to approx. 2 ft. square.
The above machines can be viewed by arrangement; no dealers need apply.—Reply, Box 492, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

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Sand Mills, 6-ft., 5-ft. and 4-ft. 6-in. dia. Pans.
Rotoil "Senior" Oil Core Sand Mixer.
Pneulec Sand Drying Plant, output 1 ton per hour.
Brearley Type Disintegrators.

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Hand and Pneumatic Types.
Also
Six Rowlands Double-ended Grinders for 24-in. dia. x 2-in. wheels.
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No. 20 Macdonald plain jolter with 90" × 90" table, jolts 8 tons	£160

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PETER—WITH ONE EXCEPTION

With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun, and on occasions—be it admitted—of naughtiness. Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice-Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception. Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated and, when older, technically trained and usefully employed. There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea?

The Chairman,

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